DRAFT

ENVIRONMENTAL IMPACT STATEMENT

BURRO MANAGEMENT

May 1994

NATIONAL PARK SERVICE - U.S. DEPARTMENT OF THE INTERIOR

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR BURRO MANAGEMENT

LAKE MEAD NATIONAL RECREATION AREA

Clark County, Nevada, and Mohave County, Arizona

Lead Agency: Department of the Interior, National Park Service, Western Region

Cooperating Agencies: Department of the Interior, Bureau of Land Management, Nevada and Arizona

Description of Action: This plan proposes the management of burros within Lake Mead National Recreation Area, Clark County, Nevada, and Mohave County, Arizona in such a manner as to comply with preservation goals and management policies of the National Park Service and Lake Mead NRA. The plan proposes to establish burro free areas within the park and to accept a certain amount of burro use in areas according to National Park Service prescriptions. The plan also proposes no range expansion or new use by burros, removal of burros from areas where they pose a resource threat or public safety hazard, and fencing sections of the park as opportunities arise.

Summary of Environmental Impact and Adverse Environmental Effects: The adverse impacts to the ecosystems by feral burros would be eliminated or reduced to allow the recovery of park resources and to minimize or prevent burros from interfering with natural processes and the perpetuation of natural features and native species. Cultural sites would no longer be subject to burro damage.

Alternatives Considered: A. No Action/Status Quo; B. Implementation of Resource Based Management; C. No Management of Burros; D. Managing a Population of Burros for Perpetuity; E. Total Removal of All Burros.

The review period for this document will end 60 days after the Environmental Protection Agency has accepted the document and published a Notice of Availability in the *Federal Register*. All review comments must be received by that time and should be addressed to:

Superintendent
Lake Mead National Recreation Area
601 Nevada Highway
Boulder City, NV 89005

For further information about this document, write the above address or call (702) 293-8946.

SUMMARY

This *Draft Environmental Impact Statement* proposes the management of exotic burros within Lake Mead National Recreation Area (NRA), Clark County, Nevada, and Mohave County, Arizona in such a manner as to comply with preservation goals and management policies of the National Park Service (NPS) and Lake Mead NRA. The plan proposes to establish burro free areas within the park and to accept a certain amount of burro use in areas according to NPS prescriptions. The plan also proposes no range expansion or new use by burros, removal of burros from areas where they pose a resource threat or public safety hazard, and fencing sections of the park as opportunities arise.

Burro use was first documented at Lake Mead NRA in 1936. An estimated 1,600 burros are present at any given time within Lake Mead NRA. Burros are an exotic species that are changing the ecological composition of the areas they utilize. They are prospering at the expense of Lake Mead NRA's native fauna and biotic communities, communities which the NPS at Lake Mead NRA is mandated to protect.

The adverse impacts to the ecosystems by burros would be eliminated or reduced to allow the recovery of park resources and to minimize or prevent burros from interfering with natural processes and the perpetuation of natural features and native species. Cultural sites would no longer be subject to burro damage.

The alternatives considered in this Draft EIS include: A. No Action/Status Quo;
B. Implementation of Resource Based Management; C. No Management of Burros;
D. Managing a Population of Burros for Perpetuity; E. Total Removal of All Burros.

Alternative A, the no-action alternative, is the continuance of the level of management that currently exists within Lake Mead NRA. Management of burros would be carried out through cooperative agreements with the Bureau of Land Management (BLM). The BLM would continue to be the lead agency in burro management at Lake Mead NRA. Under this alternative, burro use would continue in areas they currently inhabit, and would spread into areas that are now uninhabited by burros. Impacts to park resources would increase.

Alternative B, the proposed action, would include the implementation of resource based management. This alternative recognizes that NPS Management Policies require a goal of reducing exotic species populations within the recreation area to zero. However, this alternative further recognizes that this goal is not feasible at this time, nor in the foreseeable future. Burro populations would be eliminated from specific areas of the recreation area, while their populations would be managed to NPS prescriptions in other specific areas. As new technology is developed and refined, burro populations would be reduced to zero in other areas of the park. Damage to park resources from burro impacts in areas where burro populations would be reduced to zero would cease. In areas of limited burro use, impacts from burros would be reduced.

Alternative C, no management of burros, would allow the uncontrolled expansion of burro populations at Lake Mead NRA. This alternative would have detrimental impacts on park resources. As burro populations expand into previously unoccupied areas, impacts to resources would expand and increase.

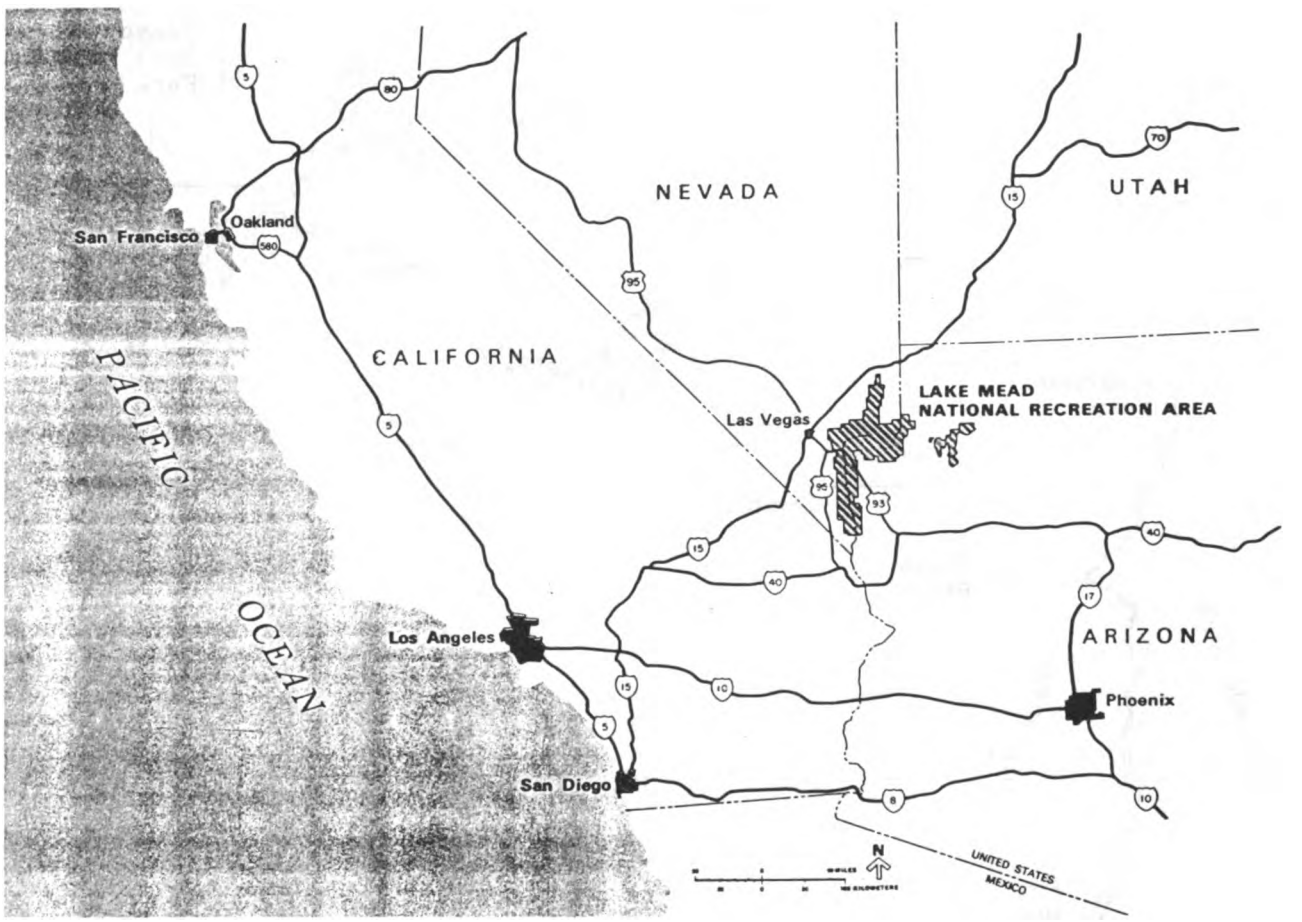
Alternative D, managing a population of burros within the park for perpetuity, would establish burro free zones and manage burros to NPS prescriptions in other park areas. Burros would remain in certain areas of the park with no attempt to reduce populations to zero. In areas where burro populations would be reduced to zero, impacts to park resources from burros would be eliminated. Where burros would remain, impacts to park resources would be reduced.

Alternative E, total removal of burros, would involve the removal of all burros from Lake Mead NRA and the fencing of park boundaries adjacent to BLM Herd Management Areas. This alternative would comply with NPS preservation goals and policies, and exotic species policies. This alternative would eliminate impacts to the recreation area caused by burros.

REGION

Lake Mead National Recreation Area

United States Department of the Interior/National Park Service
DSC/July 91/602-20,039C



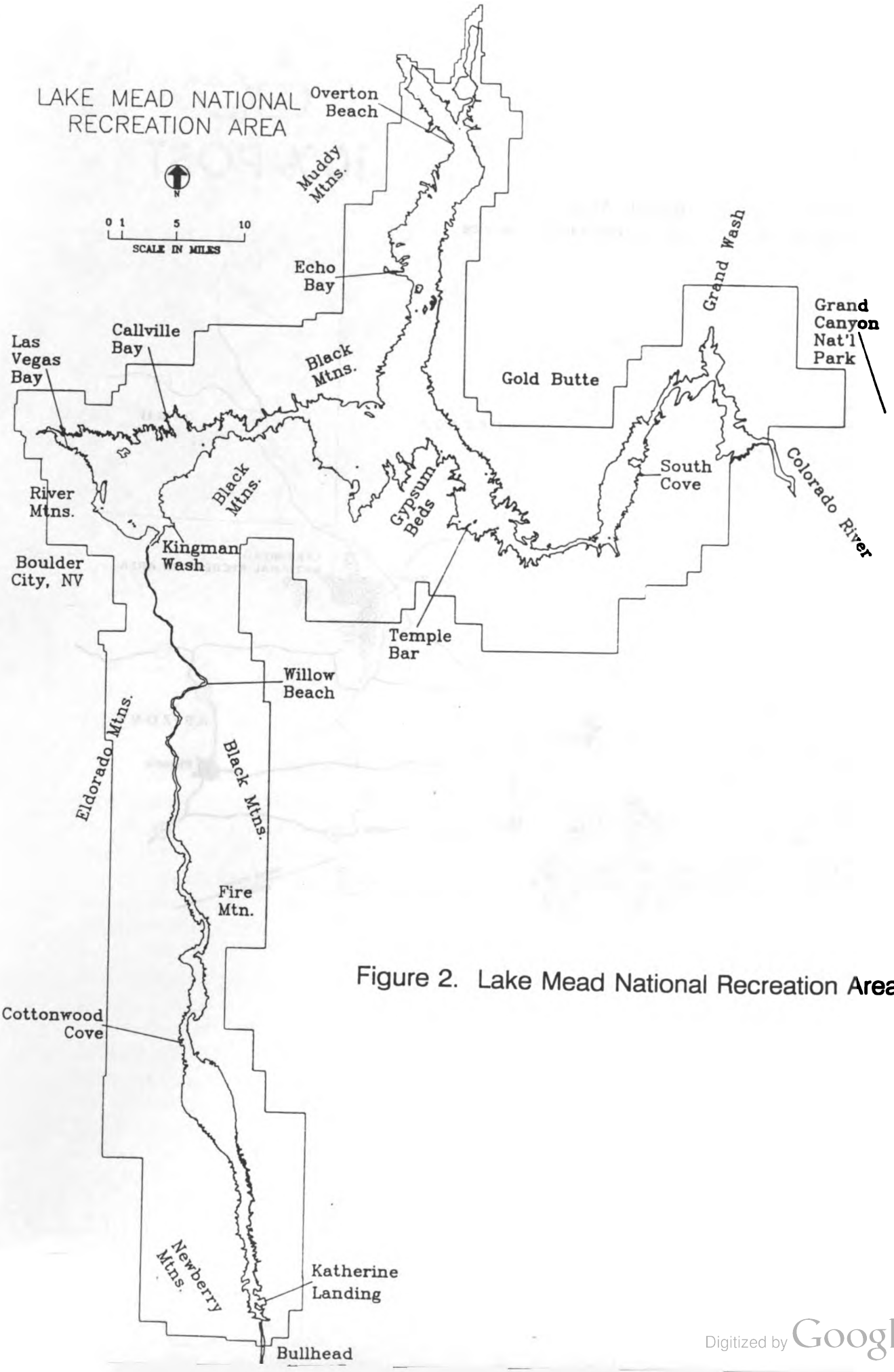


Figure 2. Lake Mead National Recreation Area

CONTENTS

ILLUSTRATIONS

TABLES

PURPOSE AND NEED FOR ACTION

INTRODUCTION

The National Park Service (NPS) began its active role at Lake Mead National Recreation Area (NRA) in 1936 after Hoover Dam was completed and an inter-agency agreement with the Bureau of Reclamation (BOR) was approved by Secretary of the Interior H.L. Ickes. The BOR retained control of the dam and the facilities relating to control of water flow and power development. The NPS became responsible for the administration and development of recreation facilities on the lakes and land area. The Boulder Dam Recreation Area, as it was called at the time, was expanded in July 1947, to include the proposed Lake Mohave and an area below Davis Dam, which was completed in 1953.

Lake Mead NRA was established October 8, 1964. Public Law 88-639 (78 Stat. 1039) was passed by Congress to:

> "provide an adequate basis for administration of the Lake Mead National Recreation Area, Arizona and Nevada...for the general purpose of public recreation, benefit and use, and in a manner that will preserve, develop, and enhance...the recreation potential, and in a manner that will preserve the scenic, historic, scientific, and other important features of the area."

The area was recognized and designated as a recreation area of significance to the Nation and included authority to provide for its management.

The Grand Canyon Expansion Bill, passed on January 3, 1975, deleted 327,215 acres from Lake Mead NRA. Currently, total acreage of the recreation area is 1,501,216 acres of which 1,484,159 acres are in federal ownership administered by the NPS and 12,568 acres are non-federal lands.

Amendments to the 1916 Organic Act (1978, 16USC1a-1) made it clear that all park units be managed and protected "in light of the high public value and integrity of the National Park System" and that no activities should be undertaken "in derogation of the values and purposes for which these various areas have been established," except where specifically authorized by law.

The recreation area encompasses 1.3 million acres of land and 200 thousand acres of water, making Lake Mead NRA the third largest area of the National Park System outside Alaska. Lake Mead NRA is often considered a water-based recreation area. Actually, 87 percent of the park is comprised of land, representing the unique ecological communities of the desert Southwest. The resource base includes plant and animal communities representative of the Mojave, Great Basin and Sonoran Deserts, and pinyon-juniper forests. The recreation area also contains riparian/native wash communities, which are among the Southwest's most threatened communities.

The first burros in North America were introduced during the 16th century by Spanish explorers. It was not until the late 1800's that domesticated burro use in the southwestern United States grew. The burro was used as a transportation or pack animal, mainly by prospectors. As mining declined and better transportation systems were devised, burros were abandoned in the region to fend for themselves. Burros thrived in the Southwest and continue to exist today.

Burro impacts were recognized by park managers at Lake Mead NRA as early as 1936. Early control measures are unclear. The first documented removal of animals from the Nevada portion of the park took place in 1979. Between 1979 and 1992, more than 1,800 burros were removed from the recreation area. An estimated 1,600 burros remain in the park.

Burros have been removed from Lake Mead NRA in the past through cooperative agreements with the Bureau of Land Management. The BLM used its capture crews and contracted capture crews for removal operations within the recreation area. The NPS often partially funded the operations. Although more than 1,800 burros have been removed from park lands in cooperation with the BLM, these removals have been unsuccessful in meeting NPS policy and controlling the expanding burro populations, and impacts to the resource have continued. For these reasons, NPS is developing the burro management plan and seeking funding for burro management within the recreation area.

The Organic Act of the NPS, The Redwood National Park Act of 1978, NPS Natural Resources Management Guidelines and NPS Management Policies provide the foundation for management of burros within the recreation area. These laws state a mandate for resource preservation, excepting only those activities specifically provided for in individual parks enabling legislation. According to these policies, management may be undertaken, up to and including eradication, when exotic species threaten park resources or public safety.

Expanding burro populations are changing the ecological composition of large areas within Lake Mead NRA. They are prospering at the expense of Lake Mead NRA's native biotic communities, communities which the NPS at Lake Mead NRA is mandated to protect. The Lake Mead NRA Environmental Impact Statement for Burro Management examines the environmental consequences of the proposed action and alternatives relating to burro management within the recreation area.

NEED FOR ACTION

The Organic Act of the NPS, as amended, and the enabling legislation of Lake Mead NRA identify the need to protect and preserve the scenic, historic, scientific and other important features of the area. Lake Mead NRA is managed under Congressional mandates for preservation, excepting only activities specifically provided for in its enabling legislation. The management policies of the NPS further specify the criteria for natural resource management.

Burros inhabit approximately 518,000 acres of the recreation area. In the past, these burros have been managed by the BLM in cooperation with the NPS. However, this management has not accomplished NPS resource preservation goals.

The NPS proposes to implement a burro management program for Lake Mead NRA. The overall objective of the burro management program is to manage the recreation area according to NPS mandates and guidelines. This can be accomplished by preventing burros from interfering with the natural processes and the perpetuation of natural features and native species, halting range expansion of burros, and preventing the threat to public safety from burros on the roadways within the park.

ALTERNATIVES INCLUDING THE PROPOSED ACTION

The alternatives assessed in this EIS include: A) No Action or continue the current level of management, B) Implement resource based management, C) No management of burros within the recreation area, D) Manage a population of burros within the park for perpetuity, and E) Total removal of all burros. Mitigating measures for resource protection have been incorporated into the proposed action and alternatives.

RELATED PLANS AND LEGISLATION

The Environmental Impact Statement for Burro Management has been developed corresponding to other plans and programs within the NPS and at Lake Mead NRA.

National Park Service Management Objectives

1. Management Policies, U.S. Department of the Interior, National Park Service, 1988, is the primary Servicewide policy document of the National Park Service. It provides direction and articulates conditions or processes that must be undertaken, considered, or complied with prior to taking action, and provides the overall foundation for management actions within the National Park Service. Included in this document are the following statements regarding management:

   "The natural zone will include lands and waters that will be managed to conserve natural resources and ecological processes and to provide for their use and enjoyment by the public in ways that do not adversely affect these resources and processes. Natural resources will be managed with a concern for fundamental ecological processes as well as for individual species and features." (4:1)

   "Park development zones are managed and maintained for visitor use. In development zones adjacent to natural zones, management will aim at maintaining as natural an environment as possible." (4:2)

"Unnatural concentrations of native species caused by human activities may be controlled if the activities causing the concentrations cannot be controlled. Nonnative (exotic) species will not be allowed to displace native species if this displacement can be prevented by management." (4:6)

"Exotic species are those that occur in a given place as a result of direct or indirect, deliberate or accidental actions by humans." (4:11) The terms exotic, non-native, introduced, and alien are synonymous terms.

"Management of populations of exotic plant and animal species up to and including eradication will be taken wherever such species 'threaten park resources' or public health and when control is prudent and feasible." (4:12)

2. NPS Guideline 77, Natural Resource Management, focuses on natural resource management in the National Park Service. The purpose of this document is to provide guidance to park managers so that natural resource management activities planned and initiated at field areas comply with federal law and regulation, with Department of the Interior, and National Park Service policy. This document provides the guidance on which park management may design, implement, and evaluate a comprehensive natural resource management program.

"Control of native animals may be justified under the following conditions if the activities causing the concentrations cannot be altered or controlled: 1)where there is an unnatural concentration of a species due to human influences [direct or indirect]; and 2)when the species' abundance has been increased by human-caused influences. Documented unnatural physical damaged from the overabundance [of native animals], including trampling of vegetation, soil compaction, rubbing or barking of trees, or wallowing that exceeds known natural levels of such disturbance, would justify control." (2:32-33)

"Control or eradication will be undertaken, where feasible, if exotic species threaten to alter natural ecosystems; seriously restrict, prey on, or compete with native populations; present a hazard to human health or safety; cause a major scenic or aesthetic intrusion; disrupt the integrity of an historic site; damage archeological resources; extensively modify geophysical processes; or threaten resources or cause a health hazard outside the park." (2:289)

3. The 1993 Statement of Management for Lake Mead NRA provides a format for evaluating conditions and identifying major issues and information voids. The park mission, as stated in this document, includes the goal to:

"Conserve and protect the Lake Mead area resources for present and future generations; provide a diversity of high quality, appropriate recreational opportunities, programs, and experiences for visitors; serve the community through public information and education programs; and operate an efficient, effective, and well-run organization that supports staff in their efforts to serve the public." (81-82)

Mission Statement Number 1, Goal Number 1, calls for the implementation of a Burro Management Plan and the establishment of priority areas for burro removals.

4. In the 1989 Resources Management Plan Guideline, the NPS has addressed major servicewide issues that relate to the need for this plan, including: impacts on threatened, endangered and other sensitive animals; degradation of park resources due to non-native animals; loss of biological diversity; loss of park resources due to consumptive practices; lack of basic data; and insufficient understanding of park ecosystems and threats to ecosystems.

5. The 1993 Resource Management Plan (NRMP) for Lake Mead NRA guides the resource management program at Lake Mead NRA and identifies resource issues and actions proposed to deal with problems or threats.

The NRMP identifies increasing burro numbers and use as threats to the natural vegetative communities, water sources, backcountry areas and wildlife habitat. Resolution of burro impacts are mandatory in order to accomplish stated park objectives of protection of rare plant species, restoration of riparian habitat, revegetation and protection of desert springs, and desert tortoise management.

The NRMP calls for the development of a Burro Management Plan and Environmental Impact Statement to evaluate a number of management alternatives and select a preferred management action in order to accomplish preservation goals.

This project is related to numerous other projects in the Lake Mead NRMP, including, but not limited to: a)restoration of native riparian habitat; b)soils and sediment monitoring; c)spring restoration; d)assess reduced species diversity; e)basic ecosystem analysis; f)burro movement study; g)burro census; and h)vegetation utilization monitoring.

Legislation Affecting Resource Management

The following laws, Executive orders, and regulations pertain to the management of natural resources in Lake Mead NRA. These serve as directions for what must be accomplished and define constraints limiting the actions of the National Park Service.

1. National Park Service Organic Act of 1916 (PL Chapter 408, 39 Stat 535) detailed the purpose of the National Park Service "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations."

   In order to fulfill these mandates, all resource planning activities must ensure that public-use facilities do not disrupt or damage resources to a degree whereby their ability to serve future visitors is reduced; that appropriate nondestructive public use and enjoyment of resources is made possible; and that conscious care and protection is provided to conserve natural and cultural park resources.

2. Executive Order 11593 directs federal agencies to survey and nominate to the Secretary of the Interior all properties under their administration that might qualify for listing on the National Register of Historic Places and to take measures which would result in the "protection and enhancement of the cultural environment."

3. The Endangered Species Act of 1973 (PL 93-205, 87 Stat 884) requires all federal agencies to consult with the Secretary of the Interior on all projects and programs having potential impact on endangered flora and fauna. The legislation further requires federal agencies to take "...such action necessary to ensure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of such endangered species and threatened species or result in the destruction or modification of habitat of such species which is determined...to be critical."

4. Notice of Clarification of Status of Wild Burros:

   The Federal Register, Vol. 42, No.57 March 24, 1977, (pp.15973 - 19574.) clarified the issue of the African wild ass (Equus asinus) being confused with the American population of burros and the reference to the African wild ass on the "United States List of Endangered Foreign Fish and Wildlife." This notice shows that the western wild burro has never been considered for designation as an endangered species. The African wild ass, however, is recognized as being "endangered" in its native habitat in Ethiopia, Somalia and Sudan. It has never been the purpose of any U.S. endangered or threatened species legislation to include the western burro in such a category.

5. The Wild Free Roaming Horse & Burro Act of 1971 (PL 92-195, 85 Stat 649) requires the protection, management and control of wild free-roaming horses and burros on public lands. "Public lands" are defined as any lands administered by the Secretary of the Interior through the Bureau of Land Management, or by the Secretary of Agriculture through the Forest Service (USFS). The National Park Service lands are exempt from this law.

6. Federal Land Policy and Management Act of 1976 (FLPMA) (PL 94-579, 99 Stat 1354) authorized the use of helicopters or motor vehicles for the purpose of transporting captured animals.

7. 1970 General Authorities Act (PL 91-383, 84 Stat 825) recognized the significance of natural, recreational and historic areas, and states that these areas should be "preserved and managed for the benefit and inspiration of all the people of the United States..."

8. The Redwood National Park Act of 1978 (PL 95-250, 92 Stat 163, as amended) contained an amendment to the National Park Service's statutory trusteeship wherein Congressional concern was re-emphasized that all National Park System units be managed and protected as parks, whether designated recreation area, or historic site.

   The amendment states that:

   "Congress further reaffirms, declares, and directs that the promotion and regulation of the various areas of the National Park System, as defined in section 1c of this title, shall be consistent with and founded in the purpose established by section 1 of this title, to the common benefit of all the people of the United States. The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation for the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

9. The Wilderness Act of 1964 (PL88-577, 78 Stat 890) established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wilderness areas". The Act stipulated that recommendations be made as to the suitability or non-suitability for preservation as wilderness of every roadless area in every unit of the National Park System. Potential wilderness areas

were studied in a Preliminary Wilderness Proposal and Environmental Statement, 1979. Twenty-five units totalling 418,655 acres were contained in the study proposal with an additional 262,125 acres of potential wilderness. These areas have not been formally recommended or designated as wilderness, therefore, they continue to be managed as primitive backcountry areas in accord with NPS policy.

Relationships to other plans and proposals

Death Valley National Monument

Burros were recognized as a problem species in Death Valley NM in the late 1930's. Burro control measures were conducted between 1938 and 1969, during which 3,578 burros were removed from the monument. Live trapping resumed in 1973, and more than 1,500 burros were removed from the park until 1982. These control measures were considered somewhat successful for stabilizing the population of burros within the monument, though not enough to stop the damage the burros were causing to park resources.

The NPS at Death Valley developed a natural and cultural resource management plan and environmental impact statement in 1981. Within the plan was a three-phase strategy to reduce the burro population to as near to zero as possible and included live removal and direct reduction, which is removing burros by shooting.

More than 6,000 burros, horses and mules were eliminated from the monument after the plan was initiated in 1981. The cost of the efforts between Fiscal Year 1983 and Fiscal Year 1988, including burro exclosure fencing, was $1,638,620.

The effects of burros on soils and vegetation may take decades to show recovery. A study in the Wildrose and Butte Valley area of the monument has shown that burro grazing caused a significant decline in perennial grasses, plus an increase in the exotic annual *Bromus rubens* due to the trampling and destruction of the cryptogamic crust in the region (Douglas 1991). In Butte Valley, the shrubs in mixed-shrub association are recovering or have recovered from damage due to browsing. Perennial forbs, such as wishbone bush (*Mirabilis bigelovii*), are recovering at a slower rate, as is vegetation in more heavily impacted areas. Data from Wildrose is inconclusive. More studies are needed.

A study on the effects of burro removal on spring use by desert bighorn sheep revealed that ewe usage of two springs, previously available to both bighorn and burros, increased (Dunn 1990). Results indicated that a niche shift had occurred, demonstrating that there was interspecific competition between burros and bighorns for spring use.

Fragile desert soils still show visible trailing and destruction years after burros were removed from the area. Recovery of these soils may take decades.

The Administrative History of the Death Valley program attributes its success to complete and thorough research and documentation before project implementation, continuous interagency cooperation between the NPS and the BLM (Appendix A), open communication with animal protection groups, and public support, gained through interpretive and public relations programs.

Grand Canyon National Park

Burros were recognized as a problem species in Grand Canyon NP as early as 1924. Managers conducted periodic control measures between 1924 and 1969, removing 2,800 burros from the park. However, these efforts did not eliminate the burro from the park, and their impacts continued to affect the Grand Canyon environment. In 1977, the Burro Management and Ecosystem Restoration Plan and Draft Environmental Statement was released for public review and was approved in 1979. Since that time, burros have been removed from Grand Canyon NP through a program of live capture, direct reduction and fencing, resulting in a population of near zero. However, some trespass of burros still occurs as burros move into Grand Canyon NP from Lake Mead NRA and adjacent BLM lands.

Bandelier National Monument

Burros were initially noticed at Bandelier NM in the late 1930's. The first written account of burros was in 1940 by Regional Biologist W.B. McDougall, who estimated a population of 15 to 19 animals frequenting the lower part of the monument. The first, large-scale reduction of burros by NPS personnel occurred in 1946 when 64 animals were eliminated. In the years following this reduction, concern was expressed about the ecological damage burros were causing to the park, but little was done to manage or study the burro herd until the 1970's.

A management plan was developed in 1977 in order to effectively manage the burro population. As an outgrowth of this plan and the environmental assessment, a burro live-capture program was initiated on April 1, 1977. A total of 20 permits involving more than 150 individuals were issued to the public at Bandelier for capture and removal of burros. Only 9 animals were successfully removed from the monument at a total effort of 300 work-hours per burro expended. The program proved infeasible for several reasons, including extremely rugged terrain and limitations for horse use dictated by topography and human-stock fatigue factors.

Following a 1977 fire, 66 burros were eliminated by direct reduction for the purpose of reducing competition between the burros and native wildlife.

Direct management actions were suspended until 1979 when the Bandelier Burro Management Plan and Environment Assessment was approved following public review. It called for a direct reduction program to eradicate the approximately 129 burros within the monument and the exclusion of burros by fencing. This reduction, along with efforts of

private organizations to remove burros by live capture has kept burro populations and impacts to a minimum within Bandelier National Monument.

Kofa National Wildlife Refuge

The Kofa National Wildlife Refuge (NWR) is located in southwestern Arizona on Yuma County. It was set aside primarily for the protection of the desert bighorn sheep and its habitat. It was originally administered by two federal agencies: the FWS and the BLM until 1976, when the Game Range Bill (P.L. 94-223) transferred sole jurisdiction of Kofa NWR to the FWS to be managed for wildlife as part of the National Wildlife Refuge System.

Approximately 160 burros inhabited two separate areas of the refuge. Burro use and impacts in the refuge were determined to contribute to the deterioration of native wildlife habitat. Since the lands involved were under the sole jurisdiction of the USFWS, it was concluded that the burros were no longer protected by the Wild Horse and Burro Act, and an Environmental Impact Statement to eliminate burro populations on Kofa NWR was finalized in 1981 (Furlow pers. comm.).

The FWS solicited the BLM to assist with the live capture and removal of burros within Kofa NWR. The BLM agreed to remove the burros as long as Kofa managers considered it economically and logistically feasible. After the removal of the majority of burros within the refuge, direct reduction methods agreed upon by both agencies were initiated.

Elimination of the burro population at Kofa NWR was necessary to improve natural habitat conditions and meet refuge objectives by: (1) increasing the diversity and abundance of wildlife by eliminating competition between native species and burros; (2) increasing the quantity and quality of the vegetation for food and cover; (3) improving soil productivity and condition by eliminating trailing, compacting and erosion; and (4) enhancing the wilderness character of the landscape by improving the structure and appearance of the vegetation (DOI 1981).

China Lake Naval Weapons Center, California

The China Lake Naval Weapons Center (NWC) occupies more than 1 million acres of land in the northern Mojave Desert near Ridgecrest, California. In 1980, an aerial survey found an estimated 3,500 to 5,700 burros inhabiting China Lake NWC. Burros in the area interfered with the livestock operation in the area, and also disrupted the Navy's operation by damaging equipment, impeding operations at the airfield and on the test ranges (Brown 1991). Burros congregated on runways, endangering the safety of aircraft crews. China Lake NWC finalized a burro management plan and EIS in 1982 with a goal of completely eliminating burros from the area. Between 1982 and 1991, more than 7,700 burros were removed from the NWC through a program of live removal and direct reduction, at a cost of nearly $747,000. China Lake NWC has realized that the goal of zero burros within the base was unrealistic, due to burros continually crossing boundaries from adjacent lands.

Bureau of Land Management

Most of the area surrounding Lake Mead NRA is administered by the Bureau of Land Management Las Vegas District, Kingman Resource Area and Arizona Strip District Offices. The BLM has differing mandates than the NPS relating to burro management. Management of burros on BLM lands is intended to achieve the objective of establishing a "thriving ecological balance" with burros as one component of the present ecosystem. This general management objective is required by the Wild and Free Roaming Horse and Burro Act. The draft Stateline Resource Management Plan for the Las Vegas District BLM, sets objectives to coordinate burro management with the NPS. Herd use areas may decrease in size within the HMA as a result of coordinated management with the NPS. The Kingman Resource Area draft Resource Management Plan and EIS sets objectives for managing burros to achieve and maintain a thriving ecological balance on public lands, and to protect all wildlife species which inhabit such lands. The Arizona Strip District Resource Management Plan states that the management of burros on public lands requires their removal from adjacent private or state land when requested, the development of a herd management area plan, the maintenance of a herd inventory, and the removal and disposal of excess animals. Burros on public land are managed at the level necessary to assure the herd's health and self-sustaining ability and free-roaming status, while maintaining an ecological balance within the HMA.

REGIONAL TRENDS

The current regional trend of managing burros is reducing or controlling population size. There are an estimated 7,750 burros on public and federal lands (BLM Congressional Report) in the southwestern United States. Currently, the BLM is removing excess burros from lands in Arizona, Nevada and California. The NPS at Death Valley NM conducts periodic burro capture and removals and practices continuous direct-reduction methods.

ALTERNATIVES INCLUDING PROPOSED ACTION

INTRODUCTION

The alternatives address the management of burros within Lake Mead NRA. Alternatives were derived through the public scoping process and in cooperation with the BLM. All reasonable alternatives were explored and objectively evaluated.

Five alternatives are presented in this section. The first, a no-action alternative, continues the current level of management. The second alternative includes resource based management that allows for a certain level of burro use. The third alternative is no management of burros. The fourth alternative is the management of burros within the park for perpetuity. The fifth alternative is the total removal of burros from the recreation area.

ALTERNATIVE A - NO ACTION
CONTINUE CURRENT LEVEL OF MANAGEMENT

Under this alternative, the BLM would continue to manage burros on Lake Mead NRA lands adjacent to BLM lands by means of cooperative agreements. Burros would be managed with the goal of achieving a state of thriving ecological balance. The BLM would continue to arrange captures on NPS lands based on BLM prescriptions and would be the lead agency in capture operations.

Burro control methods under this alternative would be the same as currently take place within the recreation area. These include live capture, including helicopter/trap, helicopter/rope, helicopter/net-gun, and corral trapping.

Helicopter/trap involves the use of a helicopter to locate the animals and herd them into a trap. Wranglers hidden by the topography or vegetation wait until the burros enter the mouth of the funnel trap and then close in behind the burros, herding them into portable corrals. The temporary traps and corrals are constructed from portable pipe panels. The trap consists of burlap wings set up like a funnel leading into a temporary corral built of portable panels. Barbed wire or other harmful materials are not used for wing construction. A temporary holding corral is constructed in the area to hold burros after capture.

Helicopter/rope is similar to helicopter/trap in that the helicopter locates the animals and herds them to a capture site. There is no trap. Wranglers are concealed by topography or vegetation. When the burros are in place, the wranglers spring from their concealment, chase and rope the burros.

Helicopter/net-gun involves the use of a helicopter to locate burros, and a net is propelled at individual burros from the helicopter by a net-gunner. Burros are then sling loaded under the helicopter and transported to a temporary corral trap constructed of portable panels.

Corral trapping involves setting up temporary corrals constructed of portable panels and using bait and/or water to induce burros to enter the corral. A finger gate or trigger gate is used, which allows the burros to enter, but not exit, the corral.

Standard operating procedures for control methods are detailed in Appendix B.

Mitigating measures for this alternative would be the same as currently takes place in the recreation area. These measures serve to minimize adverse effects to park resources and burros that could be created by the control methods.

Surveys of candidate, threatened and endangered species, and cultural resources would be conducted by qualified NPS personnel prior to construction of temporary traps or corrals. Traps, corrals, and fences would not be placed in areas that are known to contain such resources. Traps and corrals would not be located in critical wildlife areas.

Capture operations would avoid areas of known threatened or endangered species. Helicopter use would avoid areas where peregrine falcons are known to occur or potentially occur, or in areas where bald eagles are located. Helicopters would avoid habitat or potentially occupied habitat of the Southwestern willow flycatcher from May through August. This includes the northern most part of the Overton Arm and the eastern end of Lake Mead near Pearce Ferry.

If possible, traps and corrals would be located in previously disturbed areas, or in sandy or gravelly wash bottoms so damage to soils and vegetation would be minimal.

Measures to ensure humane treatment of burros are detailed in the standard operating procedures in Appendix B, and include keeping the handling of burros to a minimum, limiting the area in which burros would be herded, and terminating capture operations should temperatures reach 110 degrees or hotter.

ALTERNATIVE B - PROPOSED ACTION RESOURCE BASED MANAGEMENT

The proposed action is to eliminate or reduce burro impacts to park resources through resource-based management. NPS legislative mandates and policies dictate that the long-term goal is to manage for zero burros within the recreation area. This goal, however, is not feasible in the foreseeable future. Burro use would be accepted under NPS criteria until or unless a more feasible and prudent method of control arises.

The NPS would define burro-free areas according to NPS Management Policies (1988), including areas that have endangered, threatened, sensitive or unique resources; areas designated by the U.S. Fish and Wildlife Service (USFWS) as critical habitat for desert tortoises; areas that are historically burro free; and areas where burros cause a threat to public safety.

In areas where burros would continue to exist, the NPS would work with the BLM to set initial burro population levels for the entire burro use area including adjacent BLM Herd Management Areas. Burro use on vegetation would be monitored to manage burro use and set acceptable levels of use. Burro populations would be modified by the NPS based on NPS data other than in burro-free areas. Monitoring and utilization levels would be refined over time. Burro observations and studies would be necessary to delineate burro ranges and range-use patterns.

Control methods that would be used in the proposed action include live removal techniques, fencing and sterilization or birth control. Direct reduction, or shooting burros, is not an option under the proposed action. After a period of five years from the finalization of this plan, the proposed action would be evaluated. If the proposed control methods are determined to be ineffective or if funding levels during the first five years are consistently inadequate to control burro populations, then the use of other control methods, including direct reduction would be evaluated in a supplemental environmental analysis. The recreation area would aggressively seek partnerships with private wild horse and burro or humane organizations for captures and appropriated funds to avoid utilization of direct reduction.

Proposed Burro Management Strategies

This management plan proposes to: a) Define areas of unacceptable burro use; and b) Initiate burro management according to NPS prescriptions.

This proposal is within established laws and policies regulating the NPS and recognizes the burro as being exotic to the park. The long-term goal of burro management within Lake Mead NRA is to manage for zero burros; however, this goal is not considered feasible or prudent at this time. Limited burro use within Lake Mead NRA would be accepted in selected areas (Figure 3) under NPS criteria until or unless more feasible and prudent control methods are developed.

The goal of the proposed action is the cessation of environmental change caused by burros and the protection of the natural, cultural, and recreational resources. It intends to allow the restoration of damaged park lands and to protect and preserve native ecosystems not yet altered by burros.

Burro use would be eliminated in areas where: a) Burros cause a threat to public safety; b) Within areas that have threatened, endangered, sensitive, or unique resources, including those areas designated by the USFWS as critical habitat for the desert tortoise; c) Portions of the park that have been so severely overutilized by burros in the past that habitat recovery is not possible with any level of burro use; and d) Burros would not be allowed to expand into areas that are currently burro free.

Burro populations would be reduced to zero in the following areas of the recreation area (see Figure 3):

1. Overton Beach, Nevada, to the Muddy Mountains, Corral Springs complex, Black Mountains south of Echo Bay
(protection of sensitive soils, rare and endangered species; highway safety)

2. Portions of the Gold Butte, Nevada and Arizona
(protection of threatened species; USFWS designated critical habitat for desert tortoises; highly impacted resource recovery)

3. Eldorado Mountains and Newberry Mountains, Nevada
(protection of threatened and unique species, USFWS designated critical habitat for desert tortoises)

4. U.S. Highway 93 in Arizona from Kingman Wash to Willow Beach
(protection of unique species; highway safety)

5. Temple Bar area, Arizona (Black Mountains to Salt Spring)
(protection of sensitive soils and rare species)

6. Black Mountains, Arizona, from Willow Beach south to Cottonwood East
(protection of unique species)

Burro use would be tolerated in certain areas of the park where reducing the burro population to zero is not prudent or feasible at this time, due to the presence of burro populations on adjacent BLM lands and constraints of adjacent lands management policy, few or nonexistent barriers, and the lack of practical and cost effective control methods for these areas of the park. Burro use in these areas would be set to NPS prescriptions until the time that more effective control methods are developed. As these methods become available, amendments to the plan and EIS would be distributed for public review, with the following one exception. Boundary fences would be built to control burro immigration whenever opportunities arise. This plan calls for immediate fencing in the Gold Butte, Corral Springs, and Cottonwood East areas (Figure 4).

Lands within the park near the Muddy Mountains and Gold Butte, Nevada and Arizona; portions of the Grand Wash not designated as critical tortoise habitat; and lands within the park south of Cottonwood East, Arizona, would be areas where burros would remain, managed to NPS standards and prescriptions. Initial populations in these areas would be set in cooperation with the BLM, reflecting overall use levels within the adjacent BLM Herd Management Areas. NPS personnel would monitor burro use on vegetation, assess conditions, and adjust burro populations based on these data. In these joint use areas, NPS would accept no more than 33 percent utilization on selected key species (Appendix C). Overall carrying capacities for joint use areas would be based on forage availability on BLM administered lands.

Control Methods

Control methods that would be used in the proposed action include live removal techniques, fencing and sterilization or birth control. Direct reduction, or shooting burros, is not an option under the proposed action. After a period of five years from the finalization of this plan, the proposed action would be evaluated. If the proposed control methods are determined to be ineffective or if funding levels during the first five years are consistently inadequate to control burro populations, then the use of other control methods, including direct reduction would be evaluated in a supplemental environmental analysis. The recreation area would aggressively seek partnerships with private wild horse and burro or humane organizations for captures and appropriated funds to avoid utilization of direct reduction.

Removal operations would occur at any time of the year and would include: helicopter/trap; helicopter/rope; helicopter/net-gun; and corral trapping as described in detail under alternative A.

Dart guns utilizing tranquilizers may be used in the future. Tranquilizers would be shot at burros with dart guns to subdue the animals. The burros would be transported by helicopter to a corral and subsequently removed from the area.

Removals would be accomplished through one of the following: NPS personnel; NPS contractor; cooperative operations with the BLM; and/or cooperation with known wild horse and burro interest organizations. Animals trapped would be placed, when available, in the BLM adoption program. NPS may seek the assistance of known wild horse and burro interest organizations for placement or adoption of burros removed from the recreation area. Protocols for capture and adoptions would be developed in consultation with the BLM, wild horse and burro interest organizations, and others with experience in the field. Brief capture plans would be developed for each operation.

Birth control, including sterilization and immuno contraception, is not a feasible method to manage burro populations at this time. Sterilization would require a long-term commitment, considering that the average lifespan of a burro in the wild is 15 to 20 years. Several methods of sterilization could be used, but methods would be designed for field conditions. Immuno contraception is currently the most desirable method for reducing ungulate birth rates, but vaccines now being used must be distributed yearly. Until a longer-lasting vaccine is developed, this method would not be used. Even if a more persistent vaccine is developed, other methods would still be needed to be used to achieve desired herd sizes. Birth control is only useful as a means by which the productivity of a herd can be reduced. It is not recommended as a method for removal of a herd or even as a means for reducing herd size (Jay Kirkpatrick, pers. comm.). However, within the scope of this plan, the NPS may enter into an agreement with the BLM for birth control research and experimentation on burros located in joint use areas.

Fencing involves the construction of temporary internal fences around areas of specific concerns, and fencing along intermittent segments of the recreation area boundary. This plan proposes to fence any area of the boundary where such fencing would control the immigration of adjacent burro populations and not negatively impact native wildlife whenever adequate funding is available for construction and maintenance of these fences.

Any technology, other than fencing, that provides for more efficient and effective burro control would be evaluated in an amendment to this EIS prior to use at Lake Mead NRA. This plan provides for opportunities to construct fences that control burro immigration from adjacent areas whenever such fencing would have no negative impact on native wildlife and whenever it is economically feasible to construct and maintain the fences.

Removals in areas targeted for zero burro use would proceed immediately after the finalization of this plan. Other removals in joint use areas would be based upon findings that vegetation utilization or resource damage is above established prescription levels, or that overall area numbers, in consultation with the BLM, are out of prescription. Removal in joint use areas would be in consultation and coordination with the BLM.

Standard operating procedures for control methods are detailed in Appendix B.

Cooperative Activities and Research

BLM capture crews and burro preservation groups would be invited to participate in burro removal operations. Monitoring and utilization plots established to monitor burro impacts would continue to be used in NPS areas that burros utilize, and in burro-free areas to determine short- and long-term recovery rates after the burros have been removed (Appendix C).

Bureau of Land Management Coordination

The BLM manages the following Herd Management Areas adjacent to Lake Mead NRA (Figure 4): Black Mountain (Kingman Resource Area); Tassi-Gold Butte (Arizona Strip District); and Eldorado, Muddy Mountains, and Gold Butte (Las Vegas District). The park and each of these BLM offices have cooperatively implemented a number of management actions over the past several years, including joint animal removals, joint censusing, joint monitoring, and joint law enforcement activities.

This plan would maintain, for the foreseeable future, burro joint use areas within the park contiguous to the Black Mountains, Muddy Mountains, Gold Butte, and Grand Wash Herd Management Areas, with the exception of USFWS designated critical habitat for desert tortoises, designated as zero burro use. Initial population levels would be set in coordination with the BLM. The park would continue to coordinate management activities in these areas.

Burro removals within the recreation area, with the exception of nuisance burro removals which can occur at any time, would be based on Lake Mead NRA prescriptions. The NPS would coordinate with the BLM to determine when burro removals within joint use areas are necessary. The BLM would be invited to implement capture operations and would be consulted on trapping protocols for NPS lead operations. The NPS would request the BLM to handle burro adoption activities under this plan.

In areas recognized as joint burro use areas, the NPS and BLM would cooperate to determine acceptable burro population levels based upon monitoring and utilization studies and would work mutually to develop initial herd numbers in these joint use areas recognizing each agencies policies and prescriptions. The park would cooperate with the BLM in the development of overall vegetative monitoring, including the development of a joint use area monitoring plan. The park would cooperate with the BLM in joint censusing of joint use areas utilized by burros, and would seek opportunities for research of mutual interest relating to burro management.

The interagency Black Mountain Ecosystem Planning Team, comprised of the Bureau of Land Management Kingman Resource Area, Arizona Game and Fish Department, Lake Mead National Recreation Area, and a number of interested parties including horse and burro interest groups and bighorn sheep interest groups was formed in 1992. The initial focus of this group was to resolve conflicts arising from burro management issues; however, the group has evolved into a forum for planning for all natural resources within the Black Mountains through an ecosystem approach. The park would continue to work with the Black Mountain Ecosystem Planning Team in the development of an ecosystem management strategy for the Black Mountains in Arizona. The park would continue to work with this team to set goals and objectives for the management of this ecosystem, to define needs and coordinate research, to develop vegetation utilization and monitoring protocols, to establish population levels of burros within the Black Mountains, Arizona, and to coordinate a Black Mountain Ecosystem Management Plan.

Coordination with other organizations

Quite a number of wild horse and burro or humane organizations have contacted the park offering assistance under this plan. The park intends to consult with these groups to develop protocols for efficient and humane capture operations and for adoption operations. To the extent possible, the park intends to utilize BLM adoption programs and to work cooperatively with the BLM on trapping operations. Should these options become unavailable, or if they are inadequate, the park would invite active participation in captures and adoptions by interested horse, burro, and humane organizations.

Research

The park has been involved for the past several years in the interagency Black Mountain Ecological Planning Unit, consisting of representatives from the Kingman Resource Area BLM, the Arizona Game and Fish Department (AGF), the NPS, and several horse, burro, livestock, and bighorn sheep organizations. These efforts would continue under the proposed action. The park has a long history of cooperative management operations with the Las Vegas District BLM and the Arizona Strip BLM. From these cooperative efforts, a number of research issues of interest to each agency has arisen. Many of these research interests would still apply to the joint use areas under this plan. Opportunities for cooperative research on joint use areas would be pursued under this plan. Potential research issues include, but are not limited to, burro movement patterns and use areas, sterilization and birth control techniques, efficient and humane trapping techniques, diet studies, burro/wildlife interactive studies, vegetation monitoring techniques, and aerial census techniques.

Monitoring

Several utilization monitoring methods are currently being employed on permanent transects at Lake Mead NRA to estimate the impacts on plants from forage consumption by burros (Appendix C). Utilization transects have been established throughout the park (Figure 5), including those areas targeted for zero burro use. Initial utilization prescriptions are set at 33 percent average utilization of the vegetation for areas that burros utilized within Lake Mead NRA. Transects in areas targeted for zero burro use would be used to monitor results of removals.

Plant frequency and trend sampling is a common method of monitoring vegetation changes on rangelands (Appendix C). Approximately 60 permanent transects would be established to monitor changes in plant frequency over time.

Several density plots were established within the park by the University of Arizona in 1990. These plots were established inside and outside burro exclosures for comparative purposes to determine changes in density over time.

A burro trailing study has been initiated within the recreation area. Low-level aerial photographic points were conducted to create a map of relative trailing impacts throughout Lake Mead NRA (Figure 6). This map would be updated over time, and ground photo points would be established to monitor portions of individual trails and nearby areas. In addition, several small exclosures would be constructed to provide complete removal of additional trailing impacts and to provide photographic points of trail recovery over time. All the photographic points and exclosures would be located on soils of different texture to allow comparison of results between soil types. The primary information to be acquired through this study would be the rates of establishment and recovery of trails.

The park would cooperate with the respective adjacent BLM districts to develop overall monitoring procedures for joint use areas, including vegetation and animal numbers.

The park would cooperate with the BLM and others for joint aerial surveys of all joint-use areas, such as the 1991 survey with the Kingman Resource Area BLM and the AGF (Appendix D) and the 1993 survey with the Las Vegas District BLM.

Fencing

The proposed action calls for immediate fencing of the following areas (Figure 7): the Corral Springs - Blue Point Springs complex in the Muddy Mountains; the portion of the Gold Butte that has been so overutilized by burros that complete cessation of burro use is necessary for recovery; and the area adjacent to the existing fence near the Cottonwood East Road.

Fencing is considered a viable action for control of burro movement and immigration. It is not feasible at this time, largely due to costs, to fence large segments of the park boundary. This plan authorizes fencing of additional segments of park boundary when there is adequate funding for construction and maintenance, when it would be effective in preventing burro entry into the park and when it would not prevent the normal movements by native wildlife, principally desert bighorn sheep.

Fencing has been proven a feasible option for control of exotic species movement in various NPS areas, including Hawaii Volcanoes NP, Haleakala NP, and Pinnacles NM. Consultation with resource staff at these areas on fencing strategies would take place under this alternative.

Plans for additional fencing would be coordinated with the BLM because of joint areas of burro use. The primary areas for additional fencing could include, but are not limited to: the remainder of the park boundary in the Gold Butte area and additional portions of the Muddy Mountains.

Cost and feasibility of proposal

Under a cooperative agreement, the BLM would continue to assist in burro management at Lake Mead NRA. Currently, it has the expertise to continue burro removals, and if possible, BLM capture crews would continue to be used for operations in portions of the park where burros are known to cross from BLM lands onto NPS lands.

Also, BLM adoption facilities would be an option for distribution of NPS burros. Currently, the demand for burros in the BLM Adopt-A-Burro Program exceeds the burros available, so it is likely that most the burros removed from the recreation area would be placed in this program.

Other options for burro management include contracting private capture crews and seeking the assistance of special interest groups for removal operations. Several organizations have expressed interest in establishing burro reserves and adoption programs for burros removed from Lake Mead NRA. Burros could also be sold at livestock auctions.

Additional funding would be necessary in order to implement burro management at Lake Mead NRA. The BLM has determined that the average cost for capture per burro in high density areas where the helicopter/wrangler method is used is approximately $100. This cost increases proportionately as burro densities decrease and other removal methods must be employed. Burros are more difficult to locate, removal operations are more time consuming and more expensive methods, such as netgunning, would be required. Additional funding would be necessary to process burros for adoption. While the park has base funding to apply to burro removals, additional base funding of $150,000 per year plus special funding of $200,000 per year for 3 years would be necessary to fully implement this plan.

Mitigation

Mitigating measures would be required for removal operations. The following mitigating measures would be implemented to minimize adverse effects on the overall environment, visitors, and burros.

Measures to avoid damage to natural or cultural resources

Surveys of candidate, threatened and endangered species, and cultural resources would be conducted by qualified NPS personnel prior to construction of temporary corrals or traps, and fences. Traps, corrals, and fences would not be placed in areas that are known to contain such resources.

Traps and corral locations would not be located in critical wildlife areas. Corral traps would be closely monitored to ensure that native wildlife is not caught.

If possible, traps and corrals would be located in previously disturbed areas or in sandy or gravelly wash bottoms so damage to soils and vegetation would be minimal.

Capture operations would avoid areas of known threatened or endangered species. Helicopter use would avoid areas where peregrine falcons are known to occur or potentially occur, or in areas where bald eagles are located. Helicopters would avoid habitat or potentially occupied habitat of the Southwestern willow flycatcher from May through August. This includes the northern most part of the Overton Arm and the eastern end of Lake Mead near Pearce Ferry.

Fencing would be of such construction that it would not interfere with the movement of native wildlife nor would be it allowed to damage rare or threatened plants.

In areas where burros remain within the park, monitoring would occur to assure that burro impacts to park resources are minimal, and if impacts are occurring beyond NPS prescriptions, burro populations in those areas are reduced or eliminated.

Measures to avoid adverse effects on visitors

Wherever removal operations are being conducted, the area would be closed to visitor use. Traffic control and warning signs would be used when removal operations are located near highways and developed areas. Although closing some areas would have a temporary adverse effect on visitors, it is necessary to ensure visitor safety.

A public information program would be developed to explain the burro program to park visitors.

Measures to ensure humane treatment of burros.

Management staff involved in this program would be well trained in the efficient use and operation of capture, transport, and handling of burros and equipment. Consultation would take place with experienced BLM and horse and burro group handlers to develop handling protocols. The Standard Operating Procedures, as detailed in Appendix B, would be followed to ensure humane treatment of burros.

Daily monitoring of traps and corrals would ensure that trapped burros have adequate food and water. Trapped burros would not be crowded into holding corrals beyond the corral's capacity. As many burros as possible would be live-trapped and placed in adoption programs.

Fence construction around springs and park boundaries would take place during the cooler months to avoid water stress on excluded burros.

ALTERNATIVE C - NO MANAGEMENT OF BURROS

This is simply the act of doing nothing with the burros that utilize Lake Mead NRA. Burros would be permitted to thrive unchecked by any management. Burros would expand their range and their population would continue to increase. The BLM would continue to manage burros on their lands adjacent to the recreation area according to applicable laws and policies. Impacts to park resources would increase. There are no practical ways to mitigate impacts under this alternative.

ALTERNATIVE D - MANAGE POPULATION OF BURROS FOR PERPETUITY

This alternative is similar to the proposed action except that a population of burros would be managed for perpetuity.

The NPS would define burro-free areas according to Management Policies (1988), including areas that have endangered, threatened, sensitive or unique resources, including areas designated by the USFWS as critical habitat for desert tortoises; areas that are historically burro free; and areas where burros cause a threat to public safety.

Burro populations would be reduced to zero in certain areas of the park, as detailed under alternative B.

In areas where burros would continue to exist, the NPS would work with the BLM to set initial burro population levels for the entire burro use area including adjacent BLM Herd Management Areas. Burro use on vegetation would be monitored to manage burros and set acceptable levels of use. Burro populations would be modified by the NPS based on NPS data other than in burro-free areas. Monitoring and utilization levels would be refined over time. Burro observations and studies would be necessary to delineate burro ranges and range-use patterns.

The NPS would manage a population of burros within the park for perpetuity. Burro populations would remain in certain areas of the park according to NPS prescriptions. Burro populations would be intensively managed in the NPS portions of the Gold Butte, Muddy Mountains and portions of the recreation area south of Cottonwood East, according to NPS set vegetation utilization prescriptions. Burro numbers would be altered based on NPS monitoring. The control methods that would be used include live removal techniques, fencing, and sterilization or birth control. These methods would be employed periodically to keep burros within their NPS designated prescriptions. These method are discussed in detail under alternatives A and B.

Direct reduction is not an option under this alternative. If the control methods are determined to be ineffective or if funding levels during the first five years are consistently inadequate to control burro populations, then the use other control methods, including direct reduction would be evaluated in a supplemental environmental analysis.

Standard operating procedures for control methods are detailed in Appendix B.

Mitigating measures to avoid damage to natural and cultural resources, adverse effects on visitors, and to ensure humane treatment of burros are the same as under alternative B.

ALTERNATIVE E - TOTAL REMOVAL OF ALL BURROS

The NPS would remove all burros from Lake Mead NRA using the most effective and cost efficient methods. A combination of methods would be employed under this alternative including live removal, fencing burros outside park boundaries, use of new technology, and direct reduction. These methods are discussed in detail under alternatives A and B.

The goal of this alternative would be to use live removal methods to remove the greatest number of burros possible, followed by a direct reduction program to attempt to achieve the total removal of burros from the park. Extensive portions of park boundaries where burros could move across onto NPS lands from BLM Herd Management Areas would be fenced.

Standard operating procedures for control methods are detailed in Appendix B.

Mitigating measures under this alternative would be the same as under alternative B.

ALTERNATIVES CONSIDERED BUT NOT RECOMMENDED FOR DETAILED STUDY

Several alternatives were suggested by the public and by state and federal agencies during the formulation process of this document but were eliminated from detailed study.

The alternative to rescind the authority of the Wild Horse and Burro Act was suggested. This alternative is an issue beyond the scope of this plan, therefore, this alternative will not be considered.

An alternative was considered to zero out the population of burros within Herd Management Areas (HMA) designated by the BLM within park boundaries. This alternative was rejected because of questions concerning HMA designation within Lake Mead NRA. The NPS contends that HMA designation has no legal basis within Lake Mead NRA.

Several other alternatives were suggested during the scoping period, including implementing a hunting season on burros; reintroducing predators; culling the burro herds; transferring burros into different areas of the park; seeding areas of the park with plants that burros utilize; eliminating all burros from the Southwest; and, trading or selling burros to other countries. These alternatives were not considered realistic at this time, contradicted park purposes and policies, were outside NPS jurisdiction, or failed to reflect sound ecological principles.

TABLE 1: SUMMARY OF INITIAL ALTERNATIVES

ISSUE	ALTERNATIVE A NO ACTION	ALTERNATIVE B PROPOSED ACTION	ALTERNATIVE C NO MANAGEMENT	ALTERNATIVE D MANAGE BURROS	ALTERNATIVE E ZERO BURROS
Population Level	Maintain population of burros in park according to BLM stipulations.	Long-term goal is zero burros, however, since this is not feasible at this time, a limited number of burros would be managed in certain areas of the park to NPS prescriptions.	Population of burros in park would thrive unchecked by any management.	Burros would be eliminated from specific park areas and managed to NPS prescriptions in other areas. Burro populations would remain in park perpetually.	Burro populations would be reduced to zero.
Coordination	BLM would continue to be primary agency for burro management in the park, in cooperation with the NPS.	NPS would be lead agency for burro management within the park, in cooperation with the BLM.	None.	Same as alternative B.	Same as alternative B.
Control Methods	Live removal techniques would be used.	Live removal techniques would be the primary means to reduce or eliminate burro populations; however, as future technology is developed and refined, these technologies could be used. Fencing would occur around areas of concern and on intermittent segments of park boundaries.	None.	Live removal techniques would be the primary methods used for control and elimination of burro populations. Fencing would occur around areas of concern and on intermittent segments of park boundaries.	Elimination of burro populations by any means necessary. Fencing would occur around large portions of park boundaries.

ISSUE	ALTERNATIVE A NO ACTION	ALTERNATIVE B PROPOSED ACTION	ALTERNATIVE C NO MANAGEMENT	ALTERNATIVE D MANAGE BURROS	ALTERNATIVE E ZERO BURROS
Intent	Manage burros to a thriving ecological balance.	Manage for the cessation of environmental change caused by burros.	Allow burro populations to expand as if they were not an exotic species to the park.	Minimize environmental change caused by burros while maintaining a population of burros in the park for perpetuity.	Same as alternative B.
Relationship to policies and guidelines	Contradicts NPS exotic species management policies and guidelines. Would require amendment to NPS policies.	Complies with NPS exotic species management policies and guidelines to control exotic species that threaten park resources when prudent and feasible.	Contradicts NPS exotic species management guidelines and policies. Would require amendment to NPS policies.	Contradicts NPS exotic species management policies by allowing exotic species to exist in the park even if control or eradication becomes feasible.	Complies with NPS policies on exotic species management.
Costs	Costs currently applied by the NPS for burro management within Lake Mead NRA is approximately $100,000 per year.	In addition to current funding for burro management as stipulated under alternative A, additional base funding increase of $150,000 per year would be needed, plus special funding of $200,000 per year for the next three years.	Long-term costs of not managing burros within the recreation area would result in degradation of park resources and the failure of most resource programs. The actual amount cannot be estimated, but it would likely exceed costs outlined under alternative B.	Initial costs would be the same as alternative B, however, because burro populations would be monitored, managed, and controlled through removals for perpetuity, costs under this alternative would exceed those outlined under alternative B.	Same as alternative B.

TABLE 2: SUMMARY OF IMPACTS

IMPACT TOPIC	ALTERNATIVE A NO ACTION	ALTERNATIVE B PROPOSED ACTION	ALTERNATIVE C NO MANAGEMENT	ALTERNATIVE D MANAGE BURROS	ALTERNATIVE E ZERO BURROS
Soils	Current levels of burro management would result in enlargement of existing trails, extension of trail systems, soil compaction, soil loss, and erosion. Soil loss would lead to decreased biodiversity due to loss of vegetation.	Soil erosion from burro trampling, trailing, and wallowing would be reduced or eliminated. In areas where burros remain to NPS prescriptions, minimal impacts to soils would continue until the time that all burros could be removed. Minimal, short-term soil disturbance of soils would take place due to removal operations. Cumulative benefits include increased vegetative cover and decreased soil erosion.	Compaction and trailing would increase, trails would enlarge and expand into previously undisturbed areas. Soil erosion, compaction and decreased productivity would be primary impacts. Soil disturbance by burros would eventually alter the natural conditions of the soil.	In areas where burro populations are eliminated, impacts to soils by burros would be eliminated. In areas where burros remain and are managed for perpetuity, impacts to soils would continue, though they'd be reduced. Burros inhabiting areas of the park for perpetuity could cause long-term cumulative impacts to the soils.	Impacts to soils, by burros, would be eliminated. Eventually soils would recover and return to their natural conditions. Minimal, short-term soil disturbance would take place due to removal operations.

IMPACT TOPIC	ALTERNATIVE A NO ACTION	ALTERNATIVE B PROPOSED ACTION	ALTERNATIVE C NO MANAGEMENT	ALTERNATIVE D MANAGE BURROS	ALTERNATIVE E ZERO BURROS
Vegetation	Physical damage to plants as a result of burro trampling and browsing would continue and would expand into areas previously uninhabited by burros. There would be a decrease in forbs, shrubs, grasses, and cryptogamic crusts in burro use areas. Burros would continue to impact palo verde stands and would irreparably damage the resource.	Long-term positive impacts to plant community and riparian habitat would result where burros are eliminated. Native or exotic invader species may establish first in bare areas; eventually, native species would return. Minimal impacts to vegetation would continue where burro populations are reduced to NPS prescriptions. Short-term and localized impacts may occur to vegetation at trap locations and holding corrals. Fencing in certain areas of the park may cause negative impacts to plants.	Vegetation would continue to be depleted in burro use areas, and as burro populations expand, more vegetation would be impacted by trampling and browsing. A decrease in forbs, shrubs, and grasses in burro use areas would occur. Some species of vegetation in areas of burro use could be completely decimated. Burros would continue to impact palo verde stands and would irreparably damage this resource.	In areas where burro use is eliminated, vegetation and plant communities would eventually return to natural conditions. In areas where burros remain, vegetation would continue to be impacted though these impacts would be minimized by NPS prescriptions and management techniques. Long-term continued utilization of plant communities by burros could eventually result in the deterioration of vegetation and the loss of species diversity. Short-term localized impacts to vegetation would occur at trap sites and holding corrals. Fencing may cause negative impacts to plants.	Removing burros would result in positive, long-term benefits to the vegetative community. Short-term negative impacts may occur to vegetation at trap locations and holding corrals. Fencing would cause negative impacts to plants.

IMPACT TOPIC	ALTERNATIVE A NO ACTION	ALTERNATIVE B PROPOSED ACTION	ALTERNATIVE C NO MANAGEMENT	ALTERNATIVE D MANAGE BURROS	ALTERNATIVE E ZERO BURROS
Wildlife	Current and increased use in wildlife habitat by burros could increase competitive pressures on bighorn sheep and other wildlife. Burro use would continue to decrease the amount of forage available to wildlife, which could lead to changes in densities, species composition, and diversity of wildlife in areas of burro use.	In areas where burro use is eliminated, an increase in forage would create beneficial impacts to wildlife. Riparian areas would return to natural conditions, improving wildlife habitat. In areas where burro populations are reduced and managed to NPS prescriptions, habitat conditions should improve and wildlife should benefit. Removal operations and fencing would have no permanent impact on wildlife.	Increased burro use of wildlife habitats, food plants, and water resources could result in stress to bighorn sheep and other wildlife populations, and result in decreased species diversity and lead to changes in densities and species composition.	An increase in forage and reduction in utilization of habitat by burros would result in beneficial impacts to wildlife. In areas where burros remain, impacts would be reduced. Long-term impacts from unending burro use could result in the deterioration of habitat. Removal operations and fencing would have no permanent impact on wildlife.	The elimination of burros from the park would cause an increase in plant materials, improve habitat conditions, and result in beneficial impacts to wildlife. Removal operations and fencing would have no permanent impacts to wildlife.
Threatened/ Endangered Species	The depletion of forbs, grasses, and shrubs in burro use areas, and the expansion of burros, may cause a decline in desert tortoise populations. Candidate species of plants located in burro use areas could be negatively impacted by trampling, selective removal, and browsing.	Long-term beneficial impacts would occur to the habitat. Increased forage and cover would benefit the desert tortoise. Removal of burros would relieve plant species from possible burro impacts and may allow numbers to increase. Capture and corral sites would be surveyed to avoid damage to these species.	The depletion of forbs, shrubs, and grasses and the expansion of burros into previously undisturbed areas could result in a decline of desert tortoise populations. Candidate species of plants could be impacted by habitat loss from burro impacts.	Increased forage and cover would benefit the desert tortoise. Removal of burros would relieve plant species from possible burro impacts and may allow numbers to increase. Capture and corral sites would be surveyed prior to removal operations to avoid damage to these species.	Improved habitat conditions would benefit these species. Increased forage and cover would benefit the desert tortoise. Candidate plant species would benefit. Capture and corral sites would be surveyed to avoid damage to these species.

IMPACT TOPIC	ALTERNATIVE A NO ACTION	ALTERNATIVE B PROPOSED ACTION	ALTERNATIVE C NO MANAGEMENT	ALTERNATIVE D MANAGE BURROS	ALTERNATIVE E ZERO BURROS
Water Resources	Degradation of water resources and water quality through overbrowsing and trampling of vegetation, erosion, and fecal contamination would continue in riparian habitats. Springs and riparian habitats in areas where burro populations expand would deteriorate.	In areas where burro populations are eliminated, foraging, trampling, and fecal contamination by burros would end in riparian habitats. Natural processes would improve water quality. The amount of available water at small springs and seeps would increase. Impacts would be reduced where burro populations remain. Water quality in downslope springs and portions of the lakes would improve due to soil stabilization and lessened fecal contamination.	Degradation of water resources by burros would continue and expand into previously undisturbed areas. Water quality in downslope portions of the lakes could deteriorate due to continued and increased soil erosion and fecal contamination.	Where burro populations are eliminated, foraging, trampling, and fecal contamination by burros would end, thus allowing natural processes to restore water quality. The amount of available water at small springs and seeps would increase. Impacts in areas where burro populations are maintained would be reduced. Long-term impacts to water resources from perpetual burro use would be negative.	Impacts by burros to water resources would be eliminated, resulting in improved water quality in springs and downslope portions of the lakes. The amount of available water at small springs and seeps would increase.
Visual Resources	Burros would continue to impair visual resources through trailing, trampling, and browsing vegetation.	Visual resources would improve as recovery of soils and vegetation takes place. Minimal impacts to visual resources would continue in areas where burros remain until the time that elimination of burros is feasible.	Burros would continue to impair visual resources through trailing, trampling, and depleting vegetation. These impacts would expand as burro populations expand.	Visual resources would improve from the elimination of burros. Minimal impacts to visual resources would continue in areas where burros would remain. These impacts could eventually expand and intensify as burro populations remain in areas for perpetuity.	Visual resources would improve as burro impacts are eliminated and soils and vegetation recover.

IMPACT TOPIC	ALTERNATIVE A NO ACTION	ALTERNATIVE B PROPOSED ACTION	ALTERNATIVE C NO MANAGEMENT	ALTERNATIVE D MANAGE BURROS	ALTERNATIVE E ZERO BURROS
Air Quality	Erosion in burro use areas would continue to increase the amount of sand and light soil particles in the air. Long-term air quality may deteriorate. Burros would continue to impair visual resources through trailing, trampling, and browsing vegetation.	Increased vegetation would result in cumulative, long-term benefits to air quality. Soil stabilization would decrease the amount of dust and fine soils dispersed by winds. Short-term increases in dust levels due would result from removal operations.	Increase erosion in burro use areas would increase particulates in the air and cause long-term deterioration of air quality.	Minor, short-term reductions in air quality would occur due to removal operations. Burro trailing would continue to a lesser extent in areas of burro use, adding to dust particulates and reducing air quality on a localized basis.	The reduction of windborne particulates caused by burro impacts would result in cumulative, long-term benefits to the air quality.
Public Safety	Burro use would continue to cause a public safety hazard along certain roads within the park.	Public safety hazards along roadways by burros would be reduced.	Increases in burro-related motor vehicle accidents would be expected.	Same as alternative B.	Same as alternative B.
Public Recreation	Increased trampling and fecal contamination caused by concentrations of burros along shorelines and in some backcountry areas would continue. Burros in backcountry camping locations would continue to create noise pollution and damage property. Noise from helicopter captures could impact visitors.	Recreational use along the shorelines and in the backcountry would be enhanced in areas where burros would be removed. People would have less opportunity to view burros within the recreation area. People would have more opportunity to see or study the ecosystems in their natural conditions. Noise from helicopter captures could impact visitors.	The effects of continued and increased burro use of park resources would negatively effect the recreational environment. Those who want to view burros would receive short-term benefits. As burro populations reach their capacity and range conditions deteriorate, burro starvation and death would adversely impact those visitors wishing to view burros.	Recreation resources along shorelines and in the backcountry would be enhanced in areas where burros are eliminated. Where burro populations are managed for perpetuity, minimal impacts would continue. People would be able to view burros perpetually within certain areas of the recreation area. Noise from capture operations could impact visitors.	Recreation resources along the shorelines and in the backcountry would be enhanced. There would be no opportunity to view burros within the recreation area. People would have more opportunity to see or study park ecosystems in their natural conditions. Noise from capture operations could impact visitors.

IMPACT TOPIC	ALTERNATIVE A NO ACTION	ALTERNATIVE B PROPOSED ACTION	ALTERNATIVE C NO MANAGEMENT	ALTERNATIVE D MANAGE BURROS	ALTERNATIVE E ZERO BURROS
Livestock Grazing	Burros would continue to degrade range conditions which could result in reductions of permitted numbers, or closing of grazing allotments in areas of burro use.	Removal of burros from areas of active livestock grazing would be beneficial to permitees because NPS would not be forced to close grazing allotments due to burro damage.	Burros would continue to degrade range conditions which would result in reductions of permitted numbers or the closing of grazing allotments in areas of burro use.	Removal or reduction of burros from areas of active livestock grazing would be beneficial to permittees because the NPS would not be forced to close grazing allotments due to burro damage.	Beneficial impacts to some livestock permitees would occur through improved range conditions. NPS would not be forced to close grazing allotments due to burro damage.
Cultural Resources	Sites in areas of burro use would continue to be at risk by trampling and wallowing.	The potential for burros to damage to archeological and historic sites would be reduced or eliminated. No impacts would be created by removal operations.	Sites in areas of burro use would continue to be subject to burro impacts. As burro populations increase, the potential to damage cultural sites increases.	The potential for burros to damage cultural sites would be reduced or eliminated. In areas where burros remain, there is the possibility that burros could damage these sites. No impacts would be created by removal operations.	The potential for burros to damage cultural sites would be eliminated. No impacts would be created by removal operations.
Burros	No new impacts would occur; burros would continue to suffer short-term impacts from on-going removal operations. There would be reduced numbers of burros considered free-roaming in the Southwest.	Burros would suffer impacts from removal operations. Burros that remain within the recreation area could experience a reduced level of competition. There would be fewer burros considered free-roaming in the Southwest.	Burro populations would expand and continue to degrade range condition, and would eventually face starvation and/or death.	Same as alternative B.	Burros would suffer impacts from removal operations. Direct reduction activities would be intensified, resulting in more impacts to individual burros. There would be fewer burros considered free-roaming in the Southwest.

AFFECTED ENVIRONMENT

NATURAL ENVIRONMENT

Lake Mead NRA, with 1.3 million acres of land and nearly 200 thousand acres of water, is the third largest area of the National Park System outside Alaska. Lake Mead NRA encompasses two reservoirs on the Colorado River within southern Nevada and northwestern Arizona. The first reservoir is 110-mile-long Lake Mead, formed by Hoover Dam. At full pool (1,221 feet elevation) Lake Mead has 157,900 acres of water surface (247 square miles) with 822 miles of shoreline. The second reservoir is 67-mile-long Lake Mohave, formed by Davis Dam. At full pool (647 feet elevation) Lake Mohave has 28,260 acres of water surface with 150 miles of shoreline. Lake Mead NRA invokes the image of water, but more than 87 percent of its area is land, containing a wealth of natural and cultural resources.

Climate

The Mojave Desert is harsh and unpredictable. The summers have extreme temperatures, reaching 120 degrees Fahrenheit in July and August. Winter temperatures dip below freezing. Precipitation averages 3 to 5 inches per year in the Mojave desert. Summer thunderstorms develop quickly, and flash floods may result. However, most of the substantial rainfall in the area occurs during the gentle showers of the winter, with an occasional dusting of snow on the peaks. Humidity averages 9 to 14 percent.

The Shivwits Plateau area of the park, located on the north rim of the Grand Canyon, with an elevation of over 6,000 feet, averages 14 to 18 inches of rainfall per year, providing enough moisture to support pinyon-juniper and ponderosa pine communities.

Geology/geologic hazards

Great differences in rock type, age and structure create a unique geology in the recreation area. Geologists regularly come from all over the world to study the park's diverse geology. Rocks in the area cover nearly the full span of geologic time.

Schists of Saddle Island and metamorphic rocks of the Newberry Mountains, both from the Precambrian Period, are approximately 1.7 billion years old. Fossils from the ancient seas that occupied Lake Mead country during the Paleozoic Era can be found in the Muddy Mountains. As the desert replaced the sea during the Mesozoic Era, ancient sand dunes were hardened and are preserved along the north shore of Lake Mead. Frequent earthquakes began at the end of the Mesozoic, twisting, warping and shearing rocks. Ancient volcanic activity pushed molten rock and lava to the surface. Fortification Hill, evidence of this violent period, is crowned with layers of lava, now basalt. The powerful force of the Colorado River cut through the area, creating the Grand Canyon and the unique canyons in the Lake Mead region.

Minor earthquakes continue to shape and warp the rocks in the area. Flash floods carry mud, rock and debris in this slowly changing environment.

Topography/mountain ranges

Land rises from an elevation of 517 feet at Davis Dam to 7,072 feet at the Shivwits Plateau. Cliffs and mountain ranges, which generally run north to south, dominate the setting.

Several important washes reach the lakes, including Las Vegas Wash, Detrital Wash, Hualapi Wash, and Grand Wash. Grand Wash is located just west of Grand Canyon National Park and enters Lake Mead from the north. High cliffs raise the terrain from lake level to the Shivwits Plateau.

The Basin-and-Range Province is a region of basins separated by rugged mountain ranges, starting just west of the Grand Wash Cliffs. The Colorado River has formed broad floodplains, alluvial fans and bajadas (rolling hills at the base of a mountain) cut by arroyos in the basins.

Soil

Soils of the park support the life of the desert ecosystem. Within their fragile, rocky surfaces are stored generations of plant life in the form of seeds. Although soils have not been described in much of Lake Mead NRA, general soil characteristics can be inferred from studies made in nearby areas; Las Vegas and Eldorado Valley, Nevada (USSCS 1967) and Soil Survey of the Virgin River Area, Nevada - Arizona (USSCS 1979). These characteristics include soils with a sub-surface horizon of calcium carbonate precipitate accumulation, or caliche; sandy soils with well developed horizons; alluvial soils including wash bottoms and fine-grained materials on floodplains, which may or may not be saline; and gypsum soils.

Many of the soils within the recreation area are protected by living layers of lichens, fungus, algae and mosses called cryptogamic or cryptobiotic crusts, which play an important role in soil stabilization. These crusts protect soil from erosion by binding soil surface particles and influence water relations by reducing runoff, increasing water penetration and reducing evaporation. The crusts provide nutrients to other plants and may enhance soil fertility (Rushforth and Broterson 1982). They also act as seed catchments and offer ideal places for germination and establishment.

Desert pavement is tightly packed stone covered soils. It commonly occurs in rocks of igneous or volcanic origin, and in limestone. Desert pavement protects the underlying nutrient-rich topsoil from erosion, reduces runoff, increases infiltration, and retards evaporation (Webb 1983). Desert pavement also creates micro-environments for seed catchment, germination and establishment.

Desert pavement is often covered with a dark brown to black ferromanganese coat called desert varnish. Desert varnish takes thousands of years to form (Webb 1983) and disturbance of this and desert pavement results in the exposure of white soil undersurface.

When soils are disturbed, it often causes the loss of protective devices such as desert pavement or cryptogamic crusts. This disturbance can influence the entire plant and animal community. Soil disruptions cause soil and seed loss, which in turn causes loss of vegetative growth and wildlife cover, thereby affecting the entire community. Soils lost to disturbance may not be replaced for many centuries.

Hydrology

Lakes Mead and Mohave dominate the scene of the recreation area, but the lakes actually comprise a small percentage of the park. Away from the lakes, water is a precious resource, available only at certain times of the year at some sources, while at other sources, it can be available year-round. The recreation area contains more than 40 known springs (Appendix E). The springs are often the only source of water for miles and are essential to the survival of many species of wildlife. Small mammals and amphibians that cannot travel long distances to other water sources are particularly vulnerable.

There are several geothermal springs located within the recreation area. Hot springs are located adjacent to upper Lake Mohave and near Echo Bay at Rogers Spring and Blue Point Spring. These springs provide important habitat to unique species and also provide recreational enjoyment to park visitors.

Air quality

Lake Mead NRA is classified under the Clean Air Act as a Class II area and generally has good air quality. There are several threats to the air quality at Lake Mead NRA. Internal threats include mining, tour buses and high volume traffic, and dust. External threats to the park include regional haze from Southern California, urbanization adjacent to the park (Las Vegas, Bullhead City/Laughlin), coal-fired power plants and nearby mining activities.

Vegetation/communities

Lake Mead NRA contains plant communities representative of three of the four American desert ecosystems. The park is located on the southern edge of Great Basin, the northern edge of the Sonoran, and in the northeast portion of the Mojave Desert. As a result of this interface, the recreation area contains an immense variety of plants and animals.

Creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) co-dominate the park's most prevalent vegetative community. This community occurs generally between elevations of 500 to 3,500 feet. This community is characterized by clumps of growing plants, referred to as fertile islands, on only 10 to 20 percent of the soil. The other 80 to 90 percent of the soil serves mainly as a watershed for these islands. The soil beneath the islands is high in soil organic materials and available nutrients, while the bare soil is generally low in organic materials and has an unfavorable soil structure which exhibits less aeration. Sizable areas have a layer of desert pavement on the surface.

Although both the creosote bush and white bursage are usually found intermixed as the dominant association within this community, pure stands of either species may occur. Other common species in this community in Lake Mead NRA include four-winged saltbush (*Atriplex canescens*), range ratany (*Krameria* sp.), brittlebush (*Encelia farinosa*), Mormon tea (*Ephedra* sp.), Mojave yucca (*Yucca schidigera*), flat top buckwheat (*Eriogonum fasciculatum polifolium*), and the beavertail cactus (*Opuntia basilaris*) (Holland, Niles, and Leary 1979).

The herbaceous vegetation of this community is composed of a large number of annuals. Annuals, including composites, mustards, and legumes, are a significant component of this community and are important as forage for wildlife. The numbers and species composition of the annual vegetation varies each year, depending upon winter and early spring rains. After several successive years of below normal precipitation, there may be no annual growth. However, in wet years, annual production is extremely high, and annual flower blooms represent a stunning example of biodiversity.

The black brush (*Coleogyne ramosissima*) community exists in rocky soils at slightly higher elevations than the creosote bush community. At Lake Mead NRA, blackbrush replaces creosote bush on upper bajadas between elevations of 4,200 to 6,000 feet. The climate is cooler in the blackbrush community and the soil contains more organic matter than does the soil in the creosote bush community. Blackbrush occurs as nearly pure stands with several common associated perennial species such as banana yucca (*Yucca bacata*), Joshua tree (*Yucca brevifolia*), winterfat (*Eurotia lanata*), turpentine broom (*Thamnosma montana*), paperbag plant (*Salazaria mexicana*), desert sage (*Salvia* sp.), and spiny menodora (*Menodora spinescens*) (Holland, Niles, and Leary 1979).

The Joshua tree community occurs at the same elevations as the blackbrush community, but occupies more loose, less rocky soils of gentle slopes (Holland, Niles, and Leary). Excellent stands of Joshua tree are present in the park along Pearce Ferry Road, Aztec Wash and in Grapevine Mesa. Joshua tree, Mormon tea, and Mojave yucca are abundant at elevations between 3,500 to 5,000 feet.

The saltbush community is found where there are high levels of salt in the soil in the region's lower basins and valleys and is dispersed throughout creosote and Joshua tree communities. The soils may be several feet deep, are composed of a silty loam which is

quite saline and may develop a salt crust on the surface. Most of the plants that occur within this community are evergreen. Six species of *Atriplex* occur within the recreation area dominated by the desert saltbush (*Atriplex polycarpa*), shadscale (*Atriplex confertifolia*), desert holly (*Atriplex hymenelytra*), and four-wing saltbush (*Atriplex canescens*) (Holland 1979). Honey mesquite (*Prosopis glandulosa*) and goldenbush (*Haplopappus cooperi*) are often present as subdominants. The herbaceous vegetation in this community appears sparse compared to the surrounding desert shrub communities. Grasses found in this community include fluffgrass (*Erioneuron pulchellum*) and big galleta grass (*Hilaria rigida*). The saltbush community may occur at seeps and springs within the recreation area. In these places arrowweed (*Pluchea sericea*) and the non-native salt cedar (*Tamarix ramosissima*) are present within the community. *Atriplex* is prone to hybridizing with other species and is one of the most genetically rich of all plant genera. Hybridization between species has been known to lead to an entirely new species. Therefore, it is very important to protect the genetic integrity of the saltbush community.

The desert wash community is a transzonal community that occurs in washes from the lowest elevations of the creosote bush community to the middle elevations of the blackbrush community. The soils are silty to sandy, but may be rocky at higher elevations. In the most disturbed areas of the washes, those most prone to flash floods, catclaw (*Acacia greggii*) and desert willow (*Chilopsis linearis*) dominate. In more stable areas, near the edges of the washes, mesquite are more common. Holland, Niles, and Leary (1979) identified the typical desert wash species in Lake Mead NRA as catclaw, paperbag bush (*Salazaria mexicana*), indigo bush (*Psorothamnus fremontii*), mesquite, cheese bush (*Hymenoclea salsola*), and desert willow.

The northern-most stand of palo verde (*Cercidium microphyllum*) in North America is located in the recreation area, and is restricted to desert wash communities east of Lake Mohave in the Fire Mountain area. Ocotillo (*Fouquieria splendens*) and smoke tree (*Dalea spinosa*), species representative of the Sonoran desert wash community, terminate their range within the recreation area. These species are representatives of the biodiversity within the recreation area.

The riparian cliff community occurs in upper washes, lakeshore canyons, and several mountain escarpments in the recreation area. The soils are relatively shallow, with some litter and accumulation of organic matter, and typically are covered with rocks. At the lower elevations, cliffrose (*Cowania* sp.), rabbitbrush (*Chrysothamnus* sp.), and desert almond (*Prunus fasciculata*) are present along with plants typical of the lower communities, such as Mormon tea, banana yucca, and saltbush.

The sagebrush (*Artemisia tridentata*) community occurs only in the plateau regions of the park. The pinyon (*Pinus monophylla*)-juniper (*Juniperus osteosperma*) community is

located in the Newberry Mountains in the southwest portion of the park and on the Shivwits Plateau. Ponderosa pine woodlands are restricted to the higher elevations on the Shivwits Plateau.

Riparian ecosystems are found along springs and lakeshores. There are more than 40 springs in the recreation area, which comprise the desert spring community (Appendix E, Figure 8). Dominant species include willows (*Salix gooddingii* and *Salix exigua*), cottonwood (*Populus fremontii*) and arrowweed. An exotic species present in this community is the aggressive salt cedar. Most springs in the recreation area have been highly impacted. The greatest impacts to springs has been the invasion of salt cedar and exotic burros. The loss of vegetation from these impacts makes it critical that native vegetation still present at springs be preserved and that spring restoration programs be continued.

Stream riparian communities occur around the four perennial water sources in the recreation area: Las Vegas Wash, the Colorado River, the Muddy River, and the Virgin River. Riparian communities contain areas of alluvial deposits of sand and silt. In addition, the shorelines of Lakes Mead and Mohave display similar characteristics when lake elevation fluctuations are minimized. Riparian communities are the most productive ecosystems in the desert and are the most important habitat type in the recreation area. Historically, these areas were dominated by Fremont cottonwood trees with associated willows growing among them. On higher ground there were large areas dominated by mesquite, referred to as mesquite bosques. Saltbushes or annual and perennial grasses and forbs formed the understory. Interspersed among the cottonwoods and willows was the riparian scrubland. Dominant species included seepwillow (*Baccharis glutinosa*), broom baccharis (*Baccharis sathroides*), and arrowweed.

Today, only isolated, individual cottonwood trees or widely scattered groves containing a few trees remain. Salt cedar has replaced most of the vegetation. Salt cedar aggressively displaces native trees and shrubs, withdraws and transpires water from the ground at a high rate, and is a poor source of food and shelter for desert wildlife (Neill 1983). In April of 1987, the Commission on Arizona's Environment identified riparian habitat conservation as the highest priority environmental issue facing the state. Restoration of this community is a high priority within the recreation area.

The stream community is limited to the Colorado River upstream from Lake Mead, the Virgin and Muddy Rivers, the lower reaches of Las Vegas Wash and the Colorado River below Hoover and Davis Dams. Streamside vegetation is typical of the stream riparian community, In backwater or marshy areas, cattail and other emergents occur along with pondweeds.

The gypsophilous community consists of areas with gypsum soils. These areas are scattered throughout the Northshore Road area in the Nevada portion of the recreation area and are common in the Temple Bar area in Arizona. Several species rarely occur anywhere but on gypsum soils, including the sunray (*Enceliopsis argophylla*) and Palmer's phacelia (*Phacelia palmeri*). There are also several species that commonly and characteristically occur on gypsum soils and never occur as part of the zonal vegetation. These gypsoclines include bear paw poppy (*Arctomecon californica*), *Eriogonum insigne*, *Phacelia pulchella*, and *Camissonia multijuga*.

The cryptogamic crust community is made up of living layers of lichens, fungus, algae, and mosses. These crusts slow soil erosion, enhance infiltration of precipitation, and stimulate vascular plant growth through improved soil, water, and available nitrogen relations (Marble and Harper 1989). The disturbance of cryptogamic crusts can increase the loss of water as runoff by 51 percent and increase soil loss by 686 percent (Harper and St. Clair 1985). It is far better to avoid disturbance to these crusts than to rely on restoration, therefore, the policy of Lake Mead NRA is to avoid ground disturbance in nonlandscaped areas to the greatest extent possible (NPS 1992).

Fauna

According to Schwartz, Austin and Douglas (1978), 67 native mammals are represented in the region, including 17 varieties of bats. Forty live entirely or partly in the lower elevations of the park. Coyotes (*Canis latrans*) are the most abundant carnivorous mammal in the area. Mountain lions (*Felis concolor*) and bobcats (*Lynx rufus*) are rare, though distributed throughout the park.

Small mammals and rodents constitute the majority of species in the park. Desert cottontail (*Sylvilagus audubonii*), jackrabbits (*Lepus californicus*), kangaroo rats (*Dipodomys* sp.), and antelope ground squirrels (*Ammospermophilus leucurus*) are abundant, although most are nocturnal, avoiding the extreme heat of the day and searching for food at night.

Larger mammals are represented by the mule deer (*Odocoileus hemionus*) on the Shivwits Plateau and one of the most important desert bighorn sheep (*Ovis canadensis*) populations in the Southwest.

The desert environment, along with the riparian habitat in the park, provides a unique setting that attracts more than 57 families of birds (Blake 1978). Year-round residents include cactus wrens and canyon wrens. Great blue herons and double-crested cormorants inhabit the riparian areas.

Numerous species of waterfowl migrate through the area in the winter. Bald eagles winter throughout the park, and endangered peregrine falcons reside on the rocky cliffs year round.

Amphibians are not common in the desert regions of the park, although there are ten species of frogs and toads that occur in permanent and temporary water bodies (Schwartz et.al. 1978), including the red-spotted toad (*Bufo punctatus*), the Pacific treefrog (*Hyla regilla*) and the Great Plains toad (*Bufo cognatus*). Once thought of as extinct within Lake Mead NRA, the relict leopard frog (*Rana onca*) has recently been found in springs in the northern portion of the park. These species depend upon springs for their existence.

There are 19 known species of lizards that occur in the park (Schwartz et.al. 1978). Those frequently observed include the zebra-tailed lizard (*Callisaurus draconoides*) and the western brush lizard (*Urosaurus graciosus*). The banded gila monster (*Heloderma suspectum*) resides in the southern portion of the park, though it is rarely seen.

Schwartz, Austin and Douglas report 19 species of snakes inhabiting the region. Among those species are five poisonous snakes, including the Southwestern speckled rattlesnake (*Crotalus mitchelli*) and the Mohave rattlesnake (*Crotalus scutulatus*).

Lake Mead NRA preserves many species that are unique to the desert southwest.

Endangered Species

The desert environment combined with the lakeshore and riparian habitats at Lake Mead NRA, provides a unique habitat for plants and animals. For this reason, there are a variety of candidate, threatened or endangered species that may occur within the park.

Four plant species under review for addition to the Federal List of Endangered and Threatened Plants are known or suspected to occur in Lake Mead NRA including the bear paw poppy, Mojave Geyer milk-vetch (*Astragalus geyeri* var. *triquetris*), sticky buckwheat (*Eriogonum viscidulum*), and rosy bicolored penstemon (*Penstemon bicolor* ssp. *rosea*).

The California bear paw poppy grows in an obligate gypsophile, growing only on gypsum soils. Its global distribution is limited to southeastern Nevada and northwestern Arizona. The Mojave Geyer milk-vetch grows in loose pockets of sand in washes, gullies, and on flats to open dunes from 1500 to 2500 feet. It is found in the creosote bush community. This species is limited to the lowlands of the Colorado Plateau in southern Clark County, Nevada, and northwest Mohave County, Arizona. Sticky buckwheat is endemic and rare, growing in washes, dunes, and alluvial fans composed of deep, loose sands. It is currently known to grow only along the lower Muddy and Virgin River gorges and the Overton Arm of Lake Mead NRA. Rosy bicolored penstemon occurs on slight elevations in shallow, gravelly washes and in disturbed soils along roads. It is known to occur in Clark County, Nevada, and is reported in Mohave County, Arizona. Management of these species calls for the removal of impacts from known habitat, including those caused by burros.

Several species of wildlife are federally listed or candidates for listing. The Southwestern river otter (*Lontra canadensis sonora*), a candidate for federal listing, has been observed along Lake Mohave. Riparian habitat, such as springs, is important to other candidate species such as the relict leopard frog, the lowland leopard frog (*Rana yavapaiensis*), and the Southwestern willow flycatcher.

The mountains of the Lake Mead region provide protection for several species including the peregrine falcon, an endangered species that is known to nest on the high cliffs within the park.

The threatened desert tortoise (*Gopherus agassizi*) has inhabited portions of the recreation area for thousands of years. The tortoise is disappearing from areas across its range due to habitat destruction. Lake Mead NRA contains 700,000 acres of potential desert tortoise habitat. Critical Habitat has been designated in acres of the recreation area. Another reptile that occurs within the park is the Gila monster, a candidate species for federal listing. This shy lizard lives in the low mountains and valleys along the Colorado River drainage.

A complete listing of all candidate, threatened and endangered species that inhabit or possibly inhabit the recreation area is located in Appendix F.

Resource Program at Lake Mead NRA

In recent years, Lake Mead NRA has begun an aggressive, comprehensive resource management program. Aspects of the program include revegetation, rare plants investigations, prescribed fire, Environmental Protection Subzone preservation, desert tortoise management and managing for biodiversity.

Revegetation efforts have been undertaken throughout the park, focusing on riparian ecosystems. Through the efforts of community volunteers and local donations, new programs to perpetuate native plant life have been established along the shoreline of Lake Mohave and at a number of springs within the recreation area.

There are an estimated 85 rare plant species located in the recreation area. The Nature Conservancy and the NPS have initiated investigations to determine the status and distribution of these rare plants that occur within the recreation area.

A number of Environmental Protection Subzones have been identified within Lake Mead NRA's General Management Plan. These are areas in which the preservation of unique environmental features is the primary goal. One of these areas in Arizona preserves the northern-most existing stand of palo verde trees in the United States.

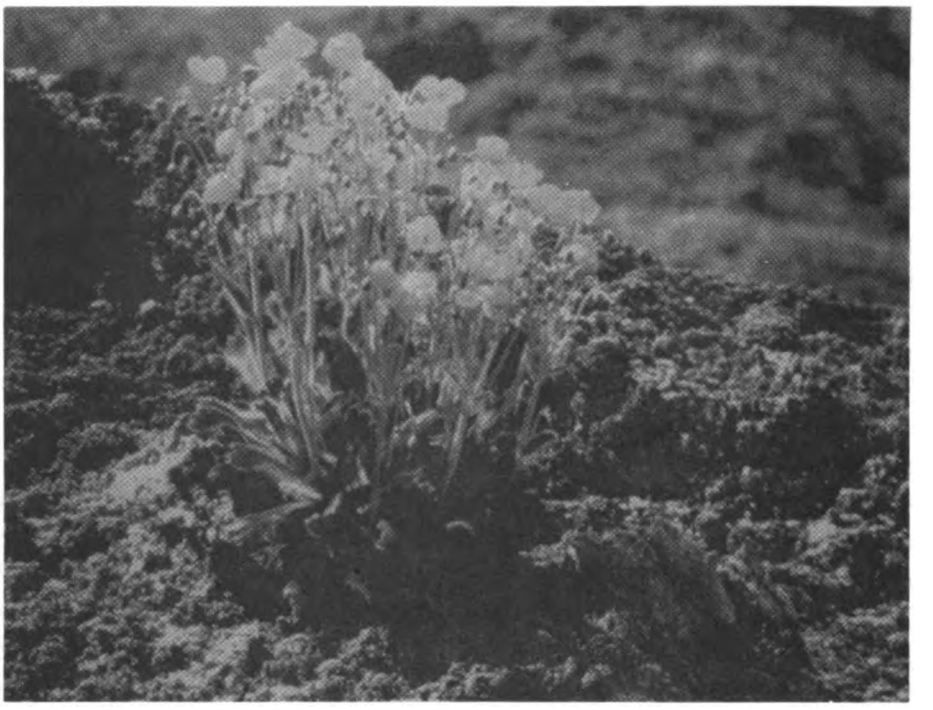


Photo 2 The bear paw poppy inhabits areas where gypsum soils are prevalent.

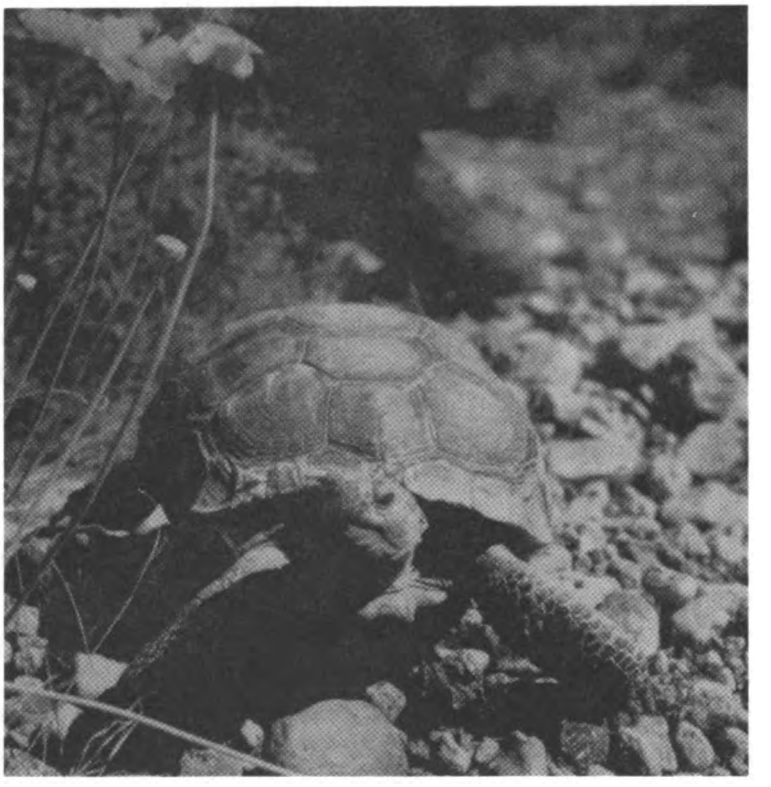


Photo 3 Tortoise Management Areas have been established within Lake Mead NRA to protect the desert tortoise.

Lake Mead NRA provides significant opportunities for protection of the threatened desert tortoise. Tortoise Management Areas and designated critical habitat for protection of the tortoise have been established in the park in cooperation with Clark County, the U.S. Fish and Wildlife Service (USFWS) and the Bureau of Land Management (BLM). Lake Mead NRA has a stated objective to manage for biodiversity. Protecting the resources at Lake Mead NRA from detrimental impacts is crucial to the success of these and other resource programs.

CULTURAL RESOURCES

Archeological

Human use of the Lake Mead region began thousands of years ago. Paleo Indians may have occupied the area 10,000 years ago; however, the first documented people of the region were the Archaic hunters and gatherers of the Desert Culture who inhabited the region some time after 3000 B.C. Around 1 A.D. to 1150 A.D., Virgin Anasazi lived in pithouses and villages along the Muddy and Virgin Rivers. These people were active traders, using routes along the Colorado River to trade local turquoise, salt, and cotton for shells, copper ore, pottery, and ocher.

More recent inhabitants in the area include the Southern Paiute, who were able to survive in the harsh desert. Four bands, the Shivwits, Moapa, Las Vegas and Chemehuevi, occupied the region. Sites are extremely rare due to the fragile characteristics of the remains.

Cerbat-Pai were hunters and gatherers who inhabited northwestern Arizona and Lake Mead country. Some of their descendants, the Mojave, farmed along the lower Colorado River from as early as 900 A.D. Their sites, and those belonging to related tribes, are scattered along the shores of Lake Mohave and portions of Lake Mead.

As Europeans moved in to the area, the remaining Native Americans were forced onto reservations.

There are 1399 known archeological sites in the Lake Mead region. Current survey and documentation has focused mainly around developed area. Artifact scatters and rock features are the most common sites. Typically these consist of scatters of chipped stone, rock circles, or cleared areas.

Archeological sites on the National Register include Grapevine Canyon Petroglyphs, Grandwash Archeological District, and the Pueblo de Nevada (Lost City). Those determined eligible for the National Register include the Overton Beach Archeological Sites and Archeological Site LAME-79A-1 (Echo Bay).

Historical

Spanish missionaries and miners are thought to have been the first Euro-Americans to enter the Lake Mead area although no records are known to exist. The first documented exploration of the area was a fur trapping expedition in 1826 led by Jedediah Smith, who followed the Virgin River to the Black Canyon of the Colorado River on his way to California. Surveyors, explorers, Mormons seeking religious freedom and prospectors soon traveled throughout the area. An important historical event occurred in 1861 when gold was discovered in Eldorado Canyon, creating a brief gold rush into the area. Sustained mining continued through the turn of the century.

The first successful navigation of the Colorado River by a steamship was in 1852 when the Uncle Sam delivered supplies to Fort Yuma. In 1857, Captain Joseph C. Ives navigated his steamer, the Explorer, as far north as the Black Canyon. River conditions were too rough for consistent navigation.

Several settlements sprung up along the Colorado River, including Callville, which was abandoned with the failure of the steamships. St. Thomas, Rioville, and Pearce Ferry were Mormon communities established, then later abandoned, in the region. The remains of the communities were inundated by Lake Mead.

Cattle ranching was established at various locations around the park in the 1880's.

No transcontinental trails occur in the park, but there are a number of regionally significant roads and trails of local historical importance.

Mines are the most common historic sites in the park.

SOCIOECONOMIC RESOURCES

Visitor use

The diversity of resources and recreation opportunities at Lake Mead NRA attracts more than 9 million visitors a year to the park, ranking it the seventh most heavily used area in the National Park System. The peak use periods for the recreation area in 1992 were from April through September, with the highest monthly visitation occurring in July. The majority of visitors to the park originate from southern Nevada, Arizona, southern California and southern Utah. Local attractions such as Las Vegas and Laughlin, Nevada, draw visitors from all over the Nation and the world to the area.

The most popular recreation activities in the park are water related and occur in the summer, including boating, sailing, water skiing, jet skiing, fishing, swimming, SCUBA, wind surfing, canoeing, and rafting.

The cooler months provide an ideal climate for fishing, camping, hiking and backcountry use, and these activities have been increasing throughout the area. In 1992, there were nearly 1.7 million overnight stays recorded in the recreation area of which almost 470 thousand were overnight backcountry stays.

Grazing

Grazing began in the region in the late 1880's, including most of the area within Lake Mead NRA. Public Law 88-639 Section 4(b) Activities (b) authorized the Secretary of the Interior to permit grazing activity within the recreation area to such extent as will not be inconsistent with recreation use or the primary use of that portion of the area. Currently, there are more than 735,000 acres that are open for grazing within the park (Appendix G).

BURROS

Burros in History

All burros inhabiting the United States are considered descendants of the Nubian and Somali wild ass (*Equus asinus*) of northeastern Africa. The burro was domesticated over 5,000 years ago in Africa and used as a beast of burden. Spanish explorers introduced the burro as a domesticated animal to North America in the 16th century. Burros proved valuable as pack animals and as a means of transportation during the settlement of the Southwest, and their use increased dramatically in the 1850's when mining opportunities enticed prospectors to the West.

As mining declined and more modern means of transportation were invented, people relied less on the burros and often abandoned them in the desert to fend for themselves. The burros adapted quickly to the arid regions of the Southwest, and their populations multiplied. The largest numbers of burros are found in California, Arizona, Nevada and Utah (BLM 1991). McKnight (1958) estimated U.S. burro populations at between 5,500 and 13,000 animals. Recent BLM and USFS estimates concluded that burro populations on lands they administer reach approximately 7,750 animals (BLM Report 1991, Appendix H). If state, Indian reservation, and Department of Defense lands were included, the burro population could total 9,500 to 10,000 animals.

The burro is protected on lands administered by the BLM and the USFS, under the Wild, Free-Roaming Horse and Burro Act of 1971. Also, burros are prolific breeders; herd sizes can increase at rates ranging from 11 to 29 percent per year (Ruffner et al. 1977, Woodward 1976). These factors ensure the continued existence of free-roaming burros in the West.

Burros were known to inhabit portions of Lake Mead NRA as early as the 1870s, when they were used in and around early mines and mining camps. Impacts from burros were noted by park managers in the 1930's and 1940's. In a 1939 newspaper article, Guy D. Edwards, National Park Superintendent, estimated that there were 400 burros within the recreation area.

Historic information on burros in the recreation area is limited. Control efforts through the 1960's were not recorded and there was no planned management of burros.

The first burro removal from the park took place in 1979 at Katherine Landing, Arizona, where 42 nuisance burros were removed. Since that time, more than 1,800 burros have been removed from the park in conjunction with the BLM and placed in holding facilities or adopted through the BLM Adopt-A-Burro Program.

Inconsistent removals due to lack of funding and management impediments have caused the removals to be inadequate for controlling the growth of the burro population. The burros successful adaptation to the Southwest deserts, the lack of predators, the low rate of accidental death, and the high reproductive rate prevent the burro population from becoming stable.

Some people believe the burro has become an integral component of southwestern desert ecosystems, is a historical part of the southwest or that the burro has replaced a "burro-sized" animal that existed during the Pleistocene Epoch. Respected authorities differ in their opinions about these beliefs, which has caused confusion over the issues relating to this plan. According to NPS policy, burros are exotic and are not an integral component of the desert ecosystems within the recreation area because they were introduced to the area as a result of deliberate or accidental actions by humans. According to NPS *Natural Resource Management Guidelines*, burros cannot be managed as a historical resource at Lake Mead NRA because burros were not introduced to the area by indigenous people prior to European settlement; burros impact native species; and burros are disruptive to native ecosystems. The management of natural resources within national park units provide the opportunity to enjoy and benefit from natural environments evolving through natural processes minimally influenced by human actions.

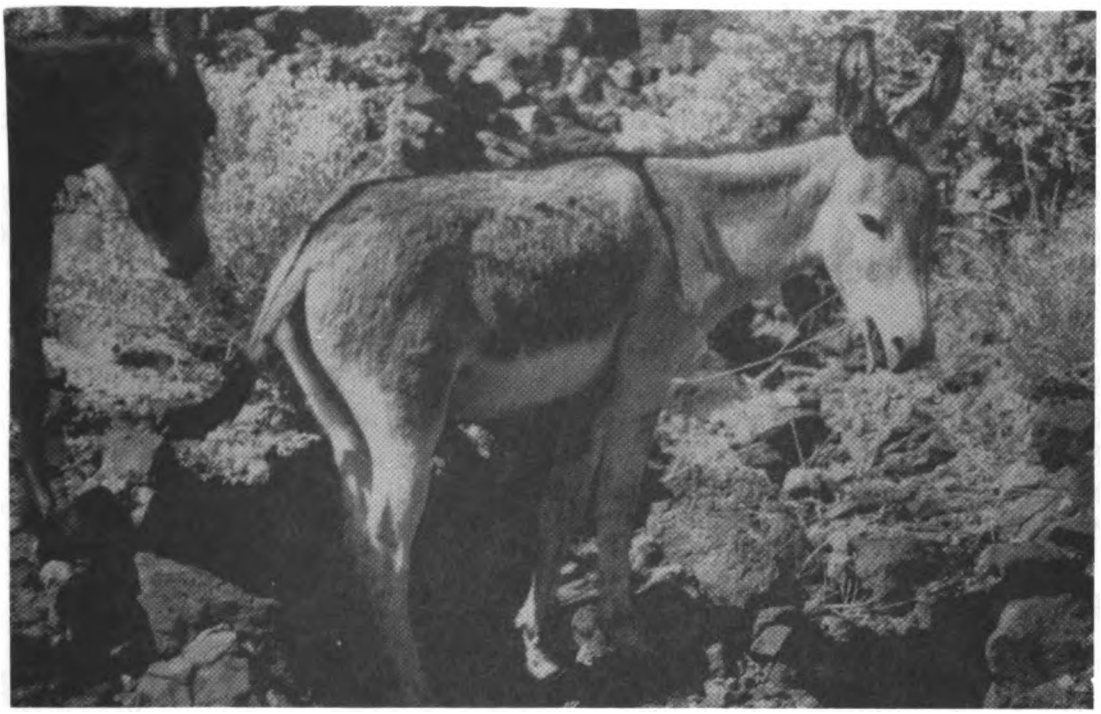


Photo 4 Burros adapted quickly to the arid Southwest. The population of burros in the United States exceeds of 8,000 animals.

Photo 5 Burro removals have taken place at Lake Mead NRA since 1979.

Distribution of Burros at Lake Mead NRA

Approximately 1,600 burros currently inhabit 809 sq. miles, or 517,760 acres, nearly one-half of Lake Mead NRA's total terrestrial acreage of 1,300,000 acres. This estimate is derived from several helicopter-based inventories between 1980 and 1991 (Appendix D) conducted by NPS, BLM and AGF personnel. Burros inhabit the following portions of Lake Mead NRA (Figure 9):

Eldorado Mountains - Lake Mohave: 225 sq. miles, 144,000 acres
Muddy Mountains - Echo Bay: 67 sq. miles, 42,880 acres
Gold Butte - Grand Wash - Tassi: 226 sq. miles, 144,640 acres
Lake Mohave - Black Mountains: 181 sq. miles, 115,840 acres
Lake Mead - Fortification Hill: 14 sq. miles, 8,960 acres
Lake Mead - Gypsum Beds: 96 sq miles, 61,440 acres

CURRENT CONDITIONS AND BASELINE DATA

Burro impacts are apparent in all areas they inhabit in the recreation area. The BLM (1981) has found that excessive trailing occurs in burro use areas. This trailing causes soil compaction and increases the rate of soil erosion, especially where the soils consist of desert pavement and microfloral crusts, on gypsum soils, and on steeper slopes (Ruffner et al. 1978). This soil alteration results in decreased site productivity.

Severe impacts to the vegetation are occurring in some sections of the recreation area due to a combination of several years of drought and grazing by burros. Since 1982, the BLM has reported that some vegetation types are being severely impacted by overgrazing, resulting in a loss of perennial vegetation and white bursage from the community. Data from vegetation transects collected in 1989 on Gold Butte revealed that there is extensive use by burros (BLM 1989). Range conditions have been severely impacted within the recreation area.

Other plants have also been negatively affected by burro use, including the northern-most stand of palo verde in the United States. Burros utilize many species of plants within the recreation area (Appendix I). Plant production may be severely impacted by burro grazing, affecting the biodiversity of park resources.

Burros tend to concentrate within 1.25 miles of water sources, such as springs and lakeshores, during the summer months (BLM 1981). This concentration at the most critical time of the year causes severe utilization of vegetation in riparian areas. Burros trample and consume vegetation. Run-off from high concentrations of burros at riparian areas can pollute the springs with feces and urine.

Soil compaction, overutilization, and the concentration of burros at riparian zones during critical times cause increased competition between the burros and native wildlife, including desert bighorn sheep. Intense competition occurs within the critical areas where burros and desert bighorn sheep co-exist and intensifies during the hot, dry months when animals are subject to increased heat stress (BLM 1981).

Additionally, burros create problems for park visitors. More than twenty burro-related automobile accidents in the park have been recorded since 1983 (NPS files, Lake Mead NRA). Burros are known to congregate near public-use areas, including campgrounds, which creates a sanitation problem. Burro feces along beaches and in backcountry camping areas reduce recreational enjoyment.

Several studies have been initiated on burro impacts within the park, including range site analysis, plant utilization, and trailing studies. Studies at Grand Canyon National Park (NP), Death Valley National Monument (NM), and Bandelier NM, along with other studies, have clearly documented the short-term and cumulative, and direct and indirect impacts of burros to the natural environment. These studies can be directly correlated to Lake Mead NRA due to the similar environmental conditions.

Soils

Research has shown that grazing pressures can change the natural condition of soil. Linnartz et al. (1966) and Hansen (1973) found that as grazing increased, soil compaction increased, and infiltration rates decreased, resulting in increased runoff of precipitation. Runoff on heavily grazed areas was 50 percent higher than on ungrazed areas (Linnartz et al 1966), even when soil moisture content was low. Runoff causes a higher amount of erosion. A soil survey at Bandelier National Monument indicated that severe erosion, with a loss of 35.7 tons of soil per acre per year, was occurring due to both a drying climate and severe overgrazing where major concentrations of burros were found (Environmental Consultants Inc. 1974). Ruffner (1978) concluded in his Grand Canyon study that soil loss is even greater on steeper areas.

Ruffner et al. (1978) found conclusive evidence that soil compaction was greater on sites with burros than sites without burros. A Death Valley National Monument study found that areas around springs received heavy impacts. Up to 5 miles away from springs, 20 to 25 percent of the soils were disturbed (Hansen 1973). The closer to the water source, the more the soil was compacted, increasing runoff, reducing spring flow and possibly drying up the water source. Soil compaction also results in reduced seed germination rates, root aeration, root feeding area and the amount of water available to plants (Fuller 1958).

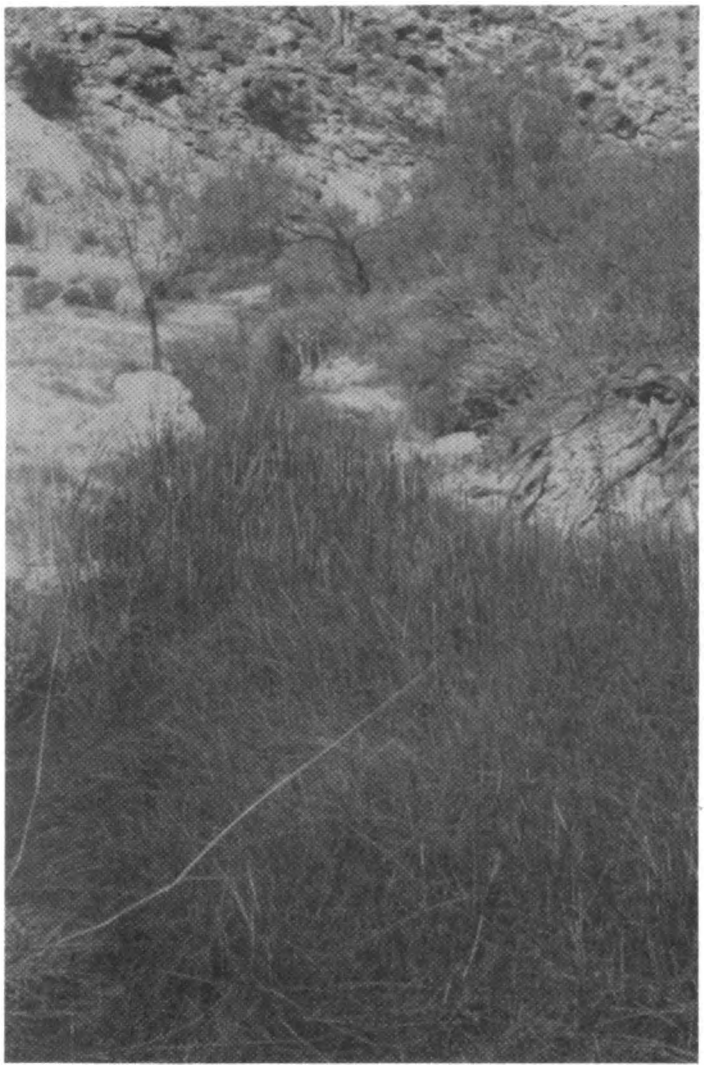


Photo 6 The upper portion of Corral Spring is not utilized by burros.

Photo 7 Some springs within the recreation area are at risk from burro impacts, such as trampling soils and vegetation, and fecal contamination.

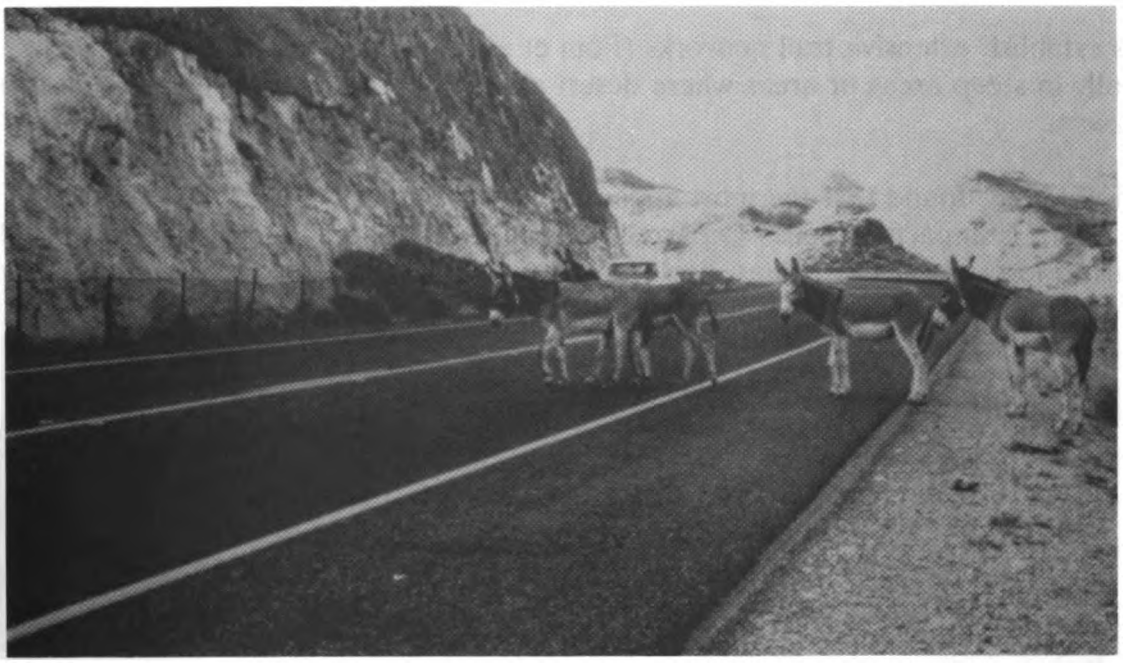


Photo 8 Burro related accidents cause damage to property, and may cause injury, or death, to people and burros.

Photo 9 More than 20 burro related automobile accidents have been recorded in the park since 1983.

Burros establish extensive trail networks (Foin et al. 1977) that increase soil erosion, especially in steep areas or areas where desert pavement soils or cryptogamic crusts are worn away.

O'Farrell (1978) found that the most apparent impact burros have on the Lake Mead environment is impacts to soils. O'Farrell determined that adjoining BLM lands acted as a buffer to lessen burro pressures, however, the network of trails on the recreation area was extensive, especially near water.

Research shows that burros change the natural condition of the soils through soil disturbance, including soil compaction, increased erosion, loss of soil structure and decreased plant establishment.

Rates of soil regeneration in arid environments are extremely slow. Soil lost may not be replaced for many centuries. Recovery rates of cryptogamic crusts and desert pavement vary from area to area, but studies suggest it may take decades for complete recovery (Webb 1983).

Vegetation

Studies at Grand Canyon NP, Death Valley NM and Bandelier NM found that over-utilization by uncontrolled or high density burro populations negatively influence vegetative communities. Many of these studies were conducted in areas with similar characteristics as Lake Mead NRA.

The Museum of Northern Arizona conducted a study in 1978 on the impacts of burros on three major plant communities within Grand Canyon NP. The Inner Gorge area, with desert flora very similar to the flora in Lake Mead NRA, had a decreased abundance of perennial grasses on areas with burros (Ruffner et al. 1978). Unpalatable shrubs increased, while mesquite, catclaw, Mormon tea and white bursage were heavily utilized.

Mistletoe infection correlated with browsing: 36 percent of catclaw and 20 percent of mesquite in areas browsed by burros contained mistletoe. Sites without burros had a much smaller percentage of mistletoe infection, with only 12 percent of catclaw, and 2 percent of mesquite infected (Ruffner et al. 1978). This also corresponds with Caruthers (1976) who found 16.5 percent mistletoe infestation on sites with burros, and 5.4 percent on sites without burros.

The population of the exotic grass red brome (*Bromus rubens*) was higher on sites with burros in the Tonto Plateau region of Grand Canyon NP. Damage to prickly pear cactus was evident, with one-half of the plants uprooted or dead at burro areas, compared to one-third dead plants in non-burro areas (Ruffner et al. 1978).

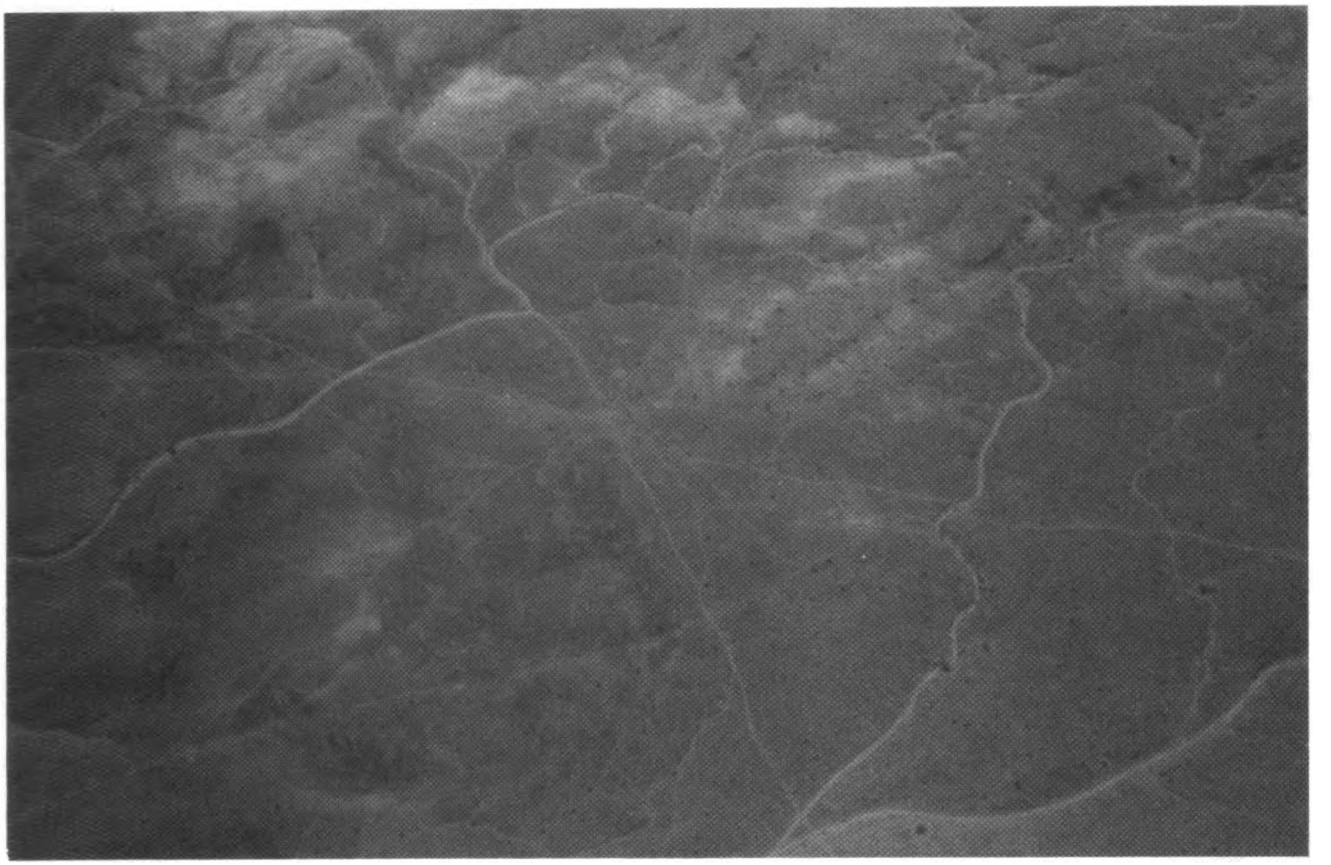


Photo 10 Gypsum soils in the Temple Bar area are severely impacted by burro trailing.

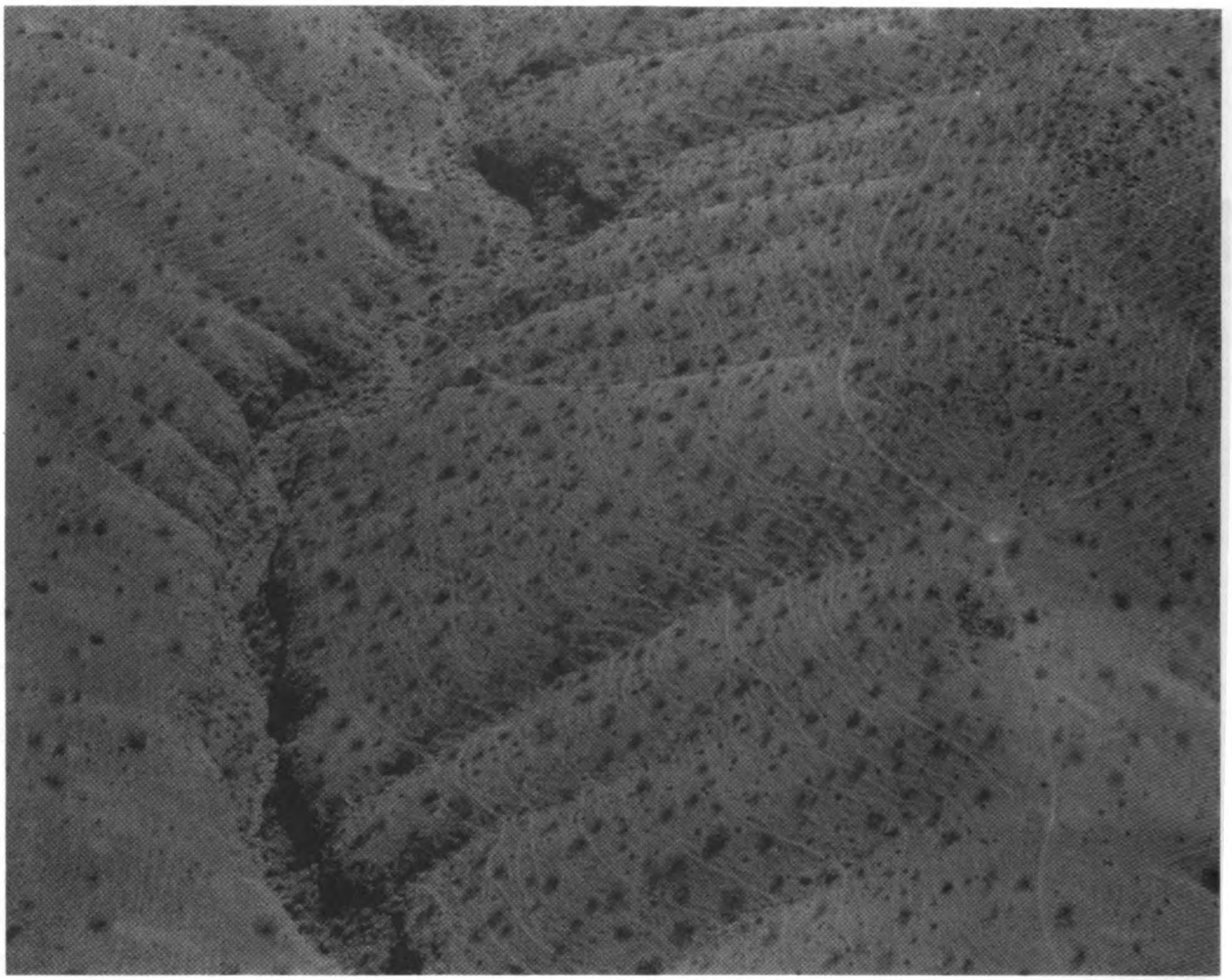


Photo 11 Trails are evident on the Gold Butte Plateau. Burros change the natural condition of the soils through soil disturbance, including soil compaction, increased erosion, loss of soil structure, and decreased plant establishment.

Seed data was collected from the Rampart and Tonto regions of Grand Canyon NP. Ruffner et al. (1978) found that seeds from perennial plants were 10 times more abundant in soils of sites without burros in Rampart, and there were twice as many perennial seeds on sites without burros in Tonto. Miscellaneous and unknown annual seeds were much more abundant in areas with burros, yet there is a high probability that these seeds were exotic or invader species (Ruffner et al. 1978).

Norment and Douglas (1977) found that browsing by burros was altering the composition of the vegetational community in Wildrose Canyon at Death Valley NM, which the burros inhabited 6 months of the year. More than 45 percent of all the shrubs present in the study site exhibited evidence of browsing, while the survival of 12.2 percent was threatened by severe browsing. Bursage was browsed so heavily (66.9 percent taking into account rodents and rabbits) that the species was in danger of being removed entirely. Goldenhead (*Acamptopappus shockleyi*) and white bursage were most affected by browsing.

Plant transects inside and outside a 1.3 acre exclosure were set up by Fisher (1975) at Death Valley NM. Fisher found that grasses and forbs numbered lower, and dead plant volumes increased outside the exclosure where burros were present. Plant volumes of goldenhead, bursage, blackbrush, dalea, and hopsage (*Grayia spinosa*) decreased outside the exclosure.

Two separate studies at Bandelier NM (Koehler 1974 and Earth Environmental Consultants, Inc. 1974) both concluded that burros caused a deterioration of range conditions and ecological changes in the monument.

Woodward (1976) found that the most important item in the burro diet along the lower Colorado River was Indian wheat (*Plantago insularis*), and, when that was unavailable,the mainstay of the diet became browse and palo verde. Mesquite and arrowweed were important during the summer months when burros were confined to riparian zones.

These studies demonstrate that burros impact native vegetative communities, affecting the distribution, abundance and composition of plant species.

Plant succession in desert areas disturbed by burros has not been well studied. However, similarly disturbed areas show that recovery of vegetation is an exceedingly slow process (Beatly 1976). Lathrop and Rowlands state in Webb (1983): "It may only be under the most favorable conditions that seedlings of the former species can become established in competition with those species which have developed under conditions of disturbance." Vasek et al. (1975) concluded that revegetation rates vary with site productivity, and that complete recovery may take hundreds of years.

O'Farrell concluded in his 1978 assessment of impacts of burros at Lake Mead NRA that within ¼-mile of a spring, 20 percent of the vegetation showed severe browse impact, and burro trails were leading to compaction and baring of the soil within that area. At the time of the study, burros were not having a significant impact on Lake Mead NRA due to above-average precipitation and greater-than-average plant production. However, he concluded that expanding burro populations and drier conditions would cause greater impacts on the resources in the park (O'Farrell, 1978).

A 1988 study conducted by the BLM at Lake Mead NRA concluded that excessive grazing by burros is taking place in the vast majority of park lands in the Gold Butte area. Further studies in 1992 by NPS personnel revealed that key forage plants favored by burros, such as perennial grasses, sweetbush, and white bursage, have been eliminated from the plant communities along the shoreline of Lake Mead to approximately ½-mile inland in the southern perimeter of Gold Butte.

Similar impacts are occurring elsewhere areas where burros are present. Within the Eldorado Mountain Range at Burro Wash, grasses are absent around the springs. Catclaw is overutilized in almost all areas where burro use is occurring. There is heavy utilization of white bursage, catclaw, and perennial grasses in the Black Mountains from the Eldorado Jeep Trail south to Mount Davis in most areas within 3/4-mile of the shoreline of Lake Mohave.

For example, within the Black Mountains in Arizona, BLM transects from 1990 through 1992 showed an average of 46 to 79 percent utilization of white bursage in burro use areas. On the Gold Butte, using the Binomial Utilization Method which measures the utilization of shrubby plants, within burro use areas the average utilization of these shrubby species, including catclaw, bursage, and Mormon tea, was from 27 to 75 percent. These and other utilization results are detailed in Appendix C.

The level of impacts in riparian areas, such as springs and lakeshores, in burro use areas is unacceptable. In all areas used by burros there are impacts to vegetation, though the level of impact lessens where there are fewer burros (Appendix C).

Native Fauna

Uncontrolled or high density populations of burros can be highly disruptive to ecosystems (Douglas 1984). Changes in native vegetation composition affect wildlife. Studies have shown that burros impact both small and large mammal populations.

Small mammal populations have been impacted by burros in Death Valley NM and Grand Canyon NP. Data from Ruffner et al. (1978) indicates that natural ecological relationships of rodent populations have been disturbed in those areas of Grand Canyon NP that supported burro populations. Populations of small mammals increased in areas that have been moderately grazed and decreased in heavily grazed areas.

Photo 12 White bursage is the co-dominate plant in the recreation area.

Photo 13 White bursage has been grazed by burros, nearly beyond the point of recovery, in some areas of the park.

Yancy (1984) established two study sites in Death Valley NM and found that the total biomass of the non-burro site was twice that of the site with burros. The non-burro site had a significantly greater rodent biomass during 85 percent of the study period. Yancy (1984) concluded that variances in plant volume caused by burros can change the community structure.

Burros and rodents depend on many of the same plant species, but rodents depend more on the seeds (Yancy 1984). Burros continuously impact plant volumes, species composition and reproductive potentials, thereby influencing seed production (Yancy 1984). Even a slight variation in available seeds can reduce an area's carrying capacity.

Studies within the pinyon-juniper woodlands in Bandelier NM demonstrated that burros have a negative impact on small mammal populations (Guthrie 1977) and avian diversity and biomass (Wauer 1978).

Hansen (1973, 1974) found that burros compete with bighorn sheep for several habitat requirements (Figure 10). The burros are competitive with the bighorn where limited water, shade and food is available, placing the bighorn under unnatural stress, particularly in the summer (Hansen 1973, 1974). Burros also compete with bighorn where burros have removed "emergency" food supplies in and around spring areas (Welles and Welles 1961). Two separate studies in the Cottonwood Mountains of Death Valley NM and in the Black Mountains of Arizona revealed a high degree of food niche overlap between burros and the desert bighorn (Ginnett 1982, Walker 1978). Since the burro is a more efficient forager in a variable environment, such as the Mojave Desert, they would be expected to be a superior competitor to the bighorn sheep (Ginnett 1982).

Dunn (1984) concluded that the presence of burros at certain springs in Death Valley NM actually limited the use of springs and surrounding habitat by ewe groups. According to Dunn, ewes appeared to avoid water sources used by burros while rams would use them but would wait longer before approaching. Following complete removal of burros from specific springs, bighorn use at the springs increased (Dunn 1984).

Resource Programs

Uncontrolled or high density burro populations threaten the success of virtually all resource programs at Lake Mead NRA. For example, revegetation efforts, especially in riparian areas, are damaged by burros. Burros spend the majority of the summer within or near riparian areas, feeding on and trampling the vegetation, thus decreasing the success rates of restoration programs.

According to Dr. Teri Knight, of the Nature Conservancy, burro use within rare plant areas, including gypsum outcroppings which support the rare bear paw poppy (Figure 11), could be in conflict with long-term preservation goals. Management guidelines must

be developed for each botanical area to decrease or eliminate impacts, including trampling impacts by burros, to species of concern (Knight 1992).

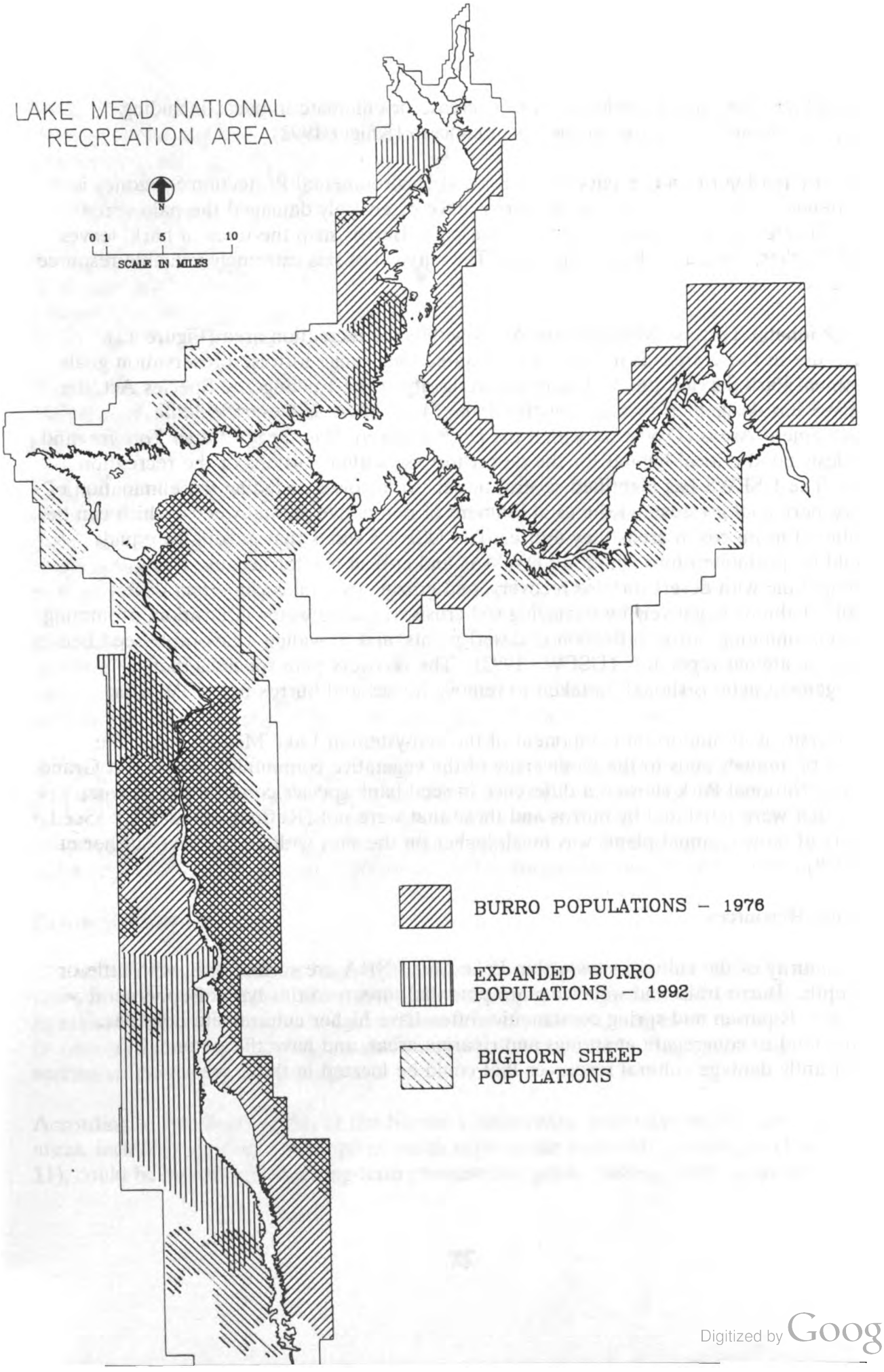
The preservation of unique park resources and Environmental Protection Subzones is threatened by burros. For example, burros have extensively damaged the palo verde stands located in the Arizona portion of the park. Burros strip the trees of bark, leaves and branches, eventually killing the tree. The survival of this extremely valuable resource is at risk.

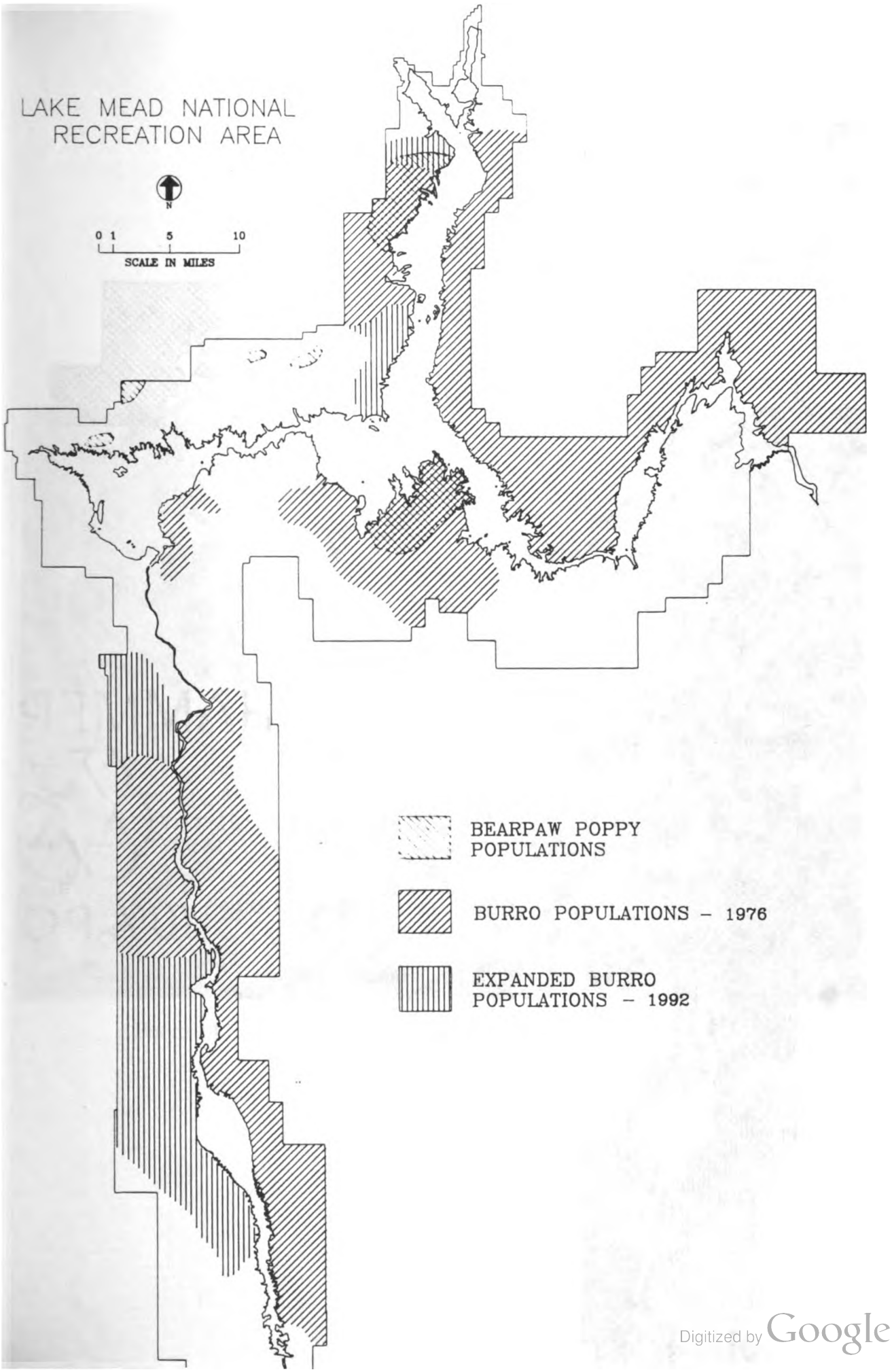
Burros inhabit Tortoise Management Areas within the recreation area (Figure 12). Burro use in these areas is in conflict with stated long range tortoise preservation goals (National Park Service 1992). Under the authority of the Endangered Species Act, the USFWS has designated two areas within Lake Mead NRA as Desert Wildlife Management Areas (DWMAs) within the *Draft Recovery Plan for the Desert Tortoise* and has designated critical habitat for the desert tortoise within portions of the recreation area. The USFWS has identified several threats to tortoises including the elimination of native perennial grasses and the establishment of non-native annual weeds, which can be attributed to burros in areas they utilize. The USFWS states that grazing by equids should be prohibited throughout all DWMAs and critical habitat because it is incompatible with desert tortoise recovery, and grazing by equids can effect desert tortoise habitats negatively by damaging soil crusts, reducing water infiltration, promoting erosion, inhibiting nitrogen fixation in desert plants, and providing a favorable seed bed for exotic annual vegetation (USFWS 1993). The recovery plan specifies that management actions should be taken to remove horses and burros from DWMAs.

Biodiversity is an important component of the ecosystem at Lake Mead NRA. The variety of annuals adds to the biodiversity of the vegetative community. Studies at Grand Canyon National Park showed a difference in seed bank species composition between areas that were inhabited by burros and those that were not (Ruffner et al. 1978). Seed density of native annual plants was much higher on the sites without burros (Ruffner et al. 1978).

Cultural Resources

The majority of the cultural sites within Lake Mead NRA are surface sites with little or no depth. Burro trails and wallowing are potential threats to this type of ephemeral resource. Riparian and spring communities often have higher cultural site densities. burros tend to congregate at springs and riparian areas, and have the potential to significantly damage cultural resources that could be located in those areas.





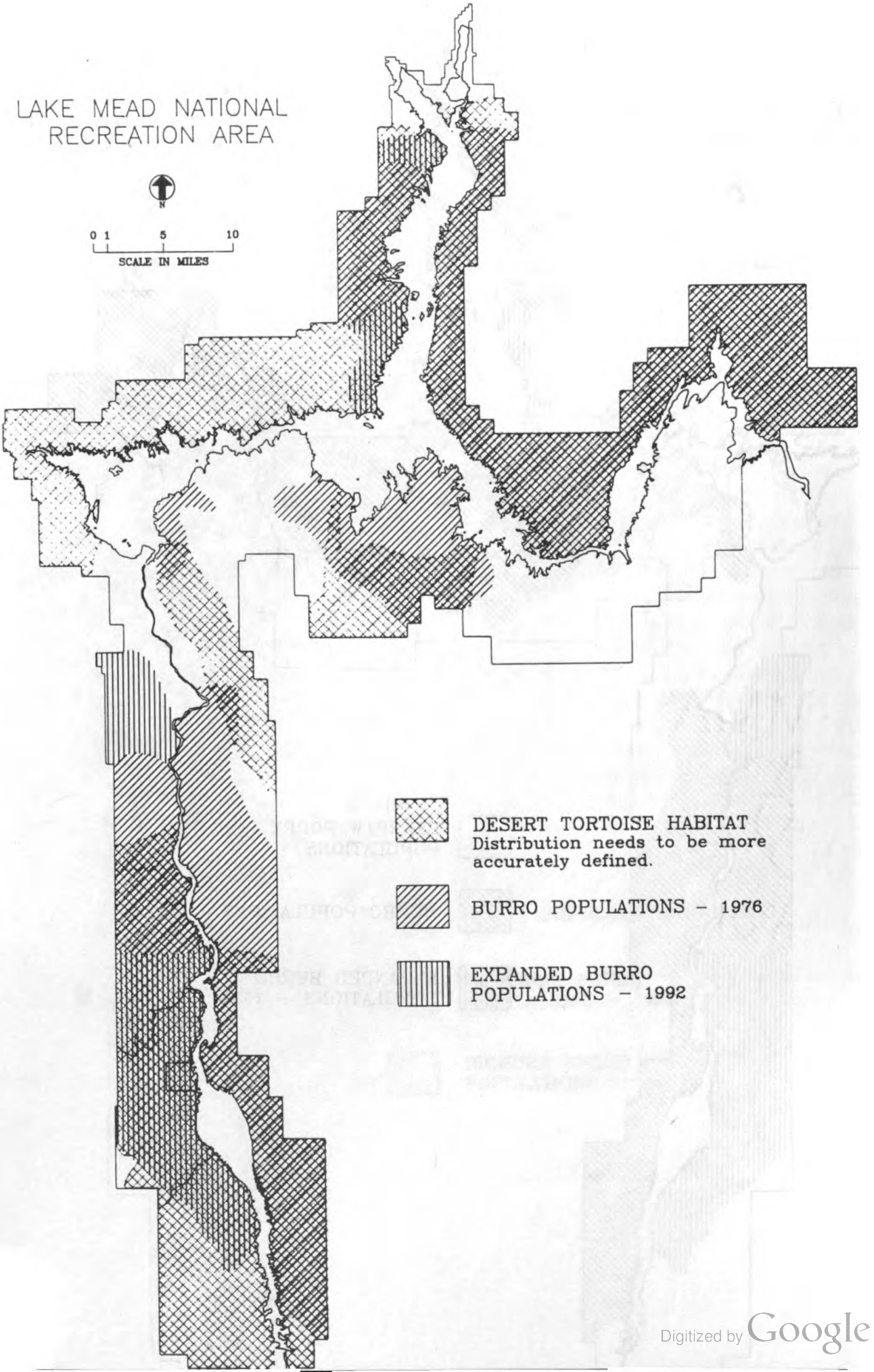


Photo 14 The northern most stand of palo verde trees in North America is located within Lake Mead NRA.

Photo 15 Where burro use coincides with palo verde stands, such as in the Fire Mountain area, burros strip palo verde of bark, leaves, and branches, and can eventually kill the tree.

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

The Lake Mead NRA planning team used the scoping process to identify and address public and management concerns relating to burro management. The significant environmental issues have been incorporated into the range of alternatives. The impacts of implementing such alternatives are analyzed in this EIS. The environmental issues that will be analyzed in the EIS include impacts to natural resources, such as soils, vegetation, wildlife, threatened and endangered species, water resources, visual resources, and air quality; socioeconomic resources, including public safety, recreation, and livestock grazing; cultural resources; and burros. Direct and indirect, short and long term, and cumulative impacts of the environment issues will be analyzed. Impacts to biodiversity will be analyzed within the soils, vegetation, wildlife, and threatened and endangered species impact categories. Floodplains, wetlands, and wild and scenic rivers will not be evaluated in this statement. These resources would not be affected by the range of alternatives.

ALTERNATIVE A: NO ACTION/CONTINUE THE STATUS QUO

Under this alternative, burros would continue to be managed within the framework of the Free-Roaming Wild Horse and Burro Act. The BLM would continue to conduct burro removal operations within Lake Mead NRA. Although the BLM has achieved a degree of success in thinning burro populations in certain portions of the recreation area, such as the Temple Bar area and the northern portion of the Black Mountains in Arizona, existing management has not been able to remove enough burros from within the recreation area to meet NPS preservation goals. If this alternative were implemented, burro management at Lake Mead NRA would continue at the current level. Burros would continue to expand their range, and burro populations would continue to increase.

Natural Resources

Impacts to soils. Burros currently establish extensive trail networks that increase soil erosion, especially in steep areas or areas where desert pavement or cryptogamic crusts are worn away. Burros are changing the natural condition of the soils through soil disturbance, including soil compaction, increased erosion, loss of soil structure and decreased plant establishment. These impacts on park soils from burros would continue and would expand as the burro population grows and enlarges its range as would be expected to occur under this alternative.

The primary types of impacts would be enlargement of existing trails, extension of trails to new areas, soil compaction and the resulting loss of soil, and erosion. Soil erosion due to reduced vegetative cover, trailing, and loss of desert pavement would be expected to

increase as burro populations increase. Soil loss would lead to decreased biodiversity due to the loss of vegetation and habitat.

Impacts to soils are long-term and cumulative. Rates of soil regeneration in arid environments are extremely slow. Recovery rates vary, but studies suggest that it may take decades for complete recovery (Webb 1983). Under this alternative, desert soils would not recover as burro impacts to park soils continue.

Impacts to vegetation. Burros have been shown to impact native vegetation within Lake Mead NRA and in similar environments. Burros affect the distribution, abundance, and composition of plant species (Woodward 1976). Studies within Lake Mead NRA have revealed that impacts to vegetation by burros are extreme in some areas of the park. Key forage plants favored by burros have been eliminated from the plant communities along the shorelines of Lake Mead to approximately ½-mile inland in the southern perimeter of the Gold Butte. Catclaw is overutilized in almost all areas where burro use occurs. Heavy utilization of white bursage, catclaw, and perennial grasses is occurring in the Black Mountains in areas that burros utilize.

Under this alternative, burros would increase in numbers and expand their range. An increased population and range would cause increased and additional disturbance to native vegetation. Physical damage to plants as a result of burro trampling and browsing would continue and increase into areas previously uninhabited by burros. Trampling or browsing by burros would result in a decrease in forbs, shrubs, grasses, and cryptogamic crusts in areas of burro use, resulting in decreased biodiversity of plant species in certain park areas. Impacts from burros to vegetation are long-term and cumulative.

Burros would continue to utilize the palo verde stands and could irreparably damage this resource.

Under this alternative, vegetation would not be expected to recover from burro impacts, and impacts to vegetation would be expected to expand into previously undisturbed areas.

Impacts to wildlife. This alternative would allow burro impacts on wildlife to continue. Changes in native vegetation composition have been shown to affect wildlife (Douglas 1984). Burros continuously impact plant volumes, species composition, and reproductive potentials in areas they utilize (Yancy 1984). This can reduce the area's carrying capacity and biodiversity.

Burro use in bighorn sheep habitat results in a decline in forage quality and quantity, negative impacts to important water sources, and competition for favored shading and resting areas (Hansen 1973,1974). Similar impacts could occur to other wildlife species, although the lack of quantitative information about the presence and role of such species

prevents forecasting specific types of impacts. Loss of habitat could result in decreased diversity of wildlife species.

Under this alternative, these impacts would continue, and would expand into areas as the burro population expands its range. These impacts are long-term and cumulative. As burro populations expand, further deterioration of habitat seems likely.

Capture operations utilizing helicopters could cause impacts to wildlife from noise. The noise of a helicopter in the removal area could cause wildlife to temporarily relocate. These impacts are short-term in nature. Wildlife would move back into the area after capture operations have ceased.

Impacts to threatened and endangered species. The elimination of native perennial grasses and the establishment of non-native annual weeds has been identified by the USFWS as a threat to desert tortoises. These conditions occur in areas that burros utilize. The depletion of forbs, grasses, and shrubs in burro areas and the expansion of burro populations may cause a decline in desert tortoise populations that depend on forbs and grasses for food, and depend upon shrubs for cover and thermoregulation.

Under this alternative, burros would continue to range in areas that have known threatened and endangered or candidate species. Impacts to the habitat, by burros, could negatively effect these species, and could cause a decrease in biodiversity.

Candidate species of plants are located in burro areas. These species could be detrimentally impacted by trampling and foraging if burro use and habitat loss through erosion in their habitat continues. This would result in a decreased diversity of these species within areas that burros utilize.

As burro populations continue to exist and expand their range, long-term cumulative impacts to threatened, endangered, and candidate species would be expected to increase, and could cause a negative impact on the overall health of these species, and their distribution and population level in the Southwest.

Impacts to water resources. Burros are known to impact water resources and riparian habitat around springs and lakeshores. These impacts include overbrowsing, trampling the soils and vegetation, and water pollution through fecal contamination. Burros tend to concentrate around riparian areas during the summer months. This concentration causes severe overutilization of vegetation in these areas.

Under this alternative, degradation of water resources would continue and would likely expand into areas previously uninhabited by burros. The success of riparian restoration programs would be impacted as burros continue to feed on and trample native vegetation. Non-native vegetation would continue to out-compete in these areas as native vegetation is impacted by burros. Riparian areas that burros utilize would suffer

long term cumulative impacts under this alternative and would not recover from burro impacts.

Impacts to visual resources. Burros would continue to impair visual resources through trailing, trampling, and depleting vegetation. Negative impacts to visual resources are long-term and cumulative. Recovery of these resources is extremely slow.

Impacts to air quality. Wind erosion in areas where burros remain would continue to increase the amount of sand and light soil particulates in the air. Long-term air quality would deteriorate as burro use expands. Helicopter use in capture operations would create minor dust pollution and emissions of hydrocarbons into the atmosphere. Impacts from helicopters would be minor and short-term.

Conclusion

Impacts by burros on park soils would continue and expand into previously undisturbed areas. Soil compaction, loss of soil structure, decreased plant establishment and diversity would continue. Native vegetation would continue to be disturbed by burro impacts, resulting in habitat deterioration for wildlife populations. Threatened, endangered, and candidate species would be impacted by the depletion of forbs, grasses, and shrubs. Candidate species of plants could be detrimentally impacted by trampling and foraging by burros, and habitat loss through erosion. Degradation of water resources would continue in areas that burros utilize. Visual resources would be negatively impacted by continued trailing, trampling, and depleting of vegetation by burros. Air quality would deteriorate as burros continue to create erosion through soil disturbance.

Socioeconomic Resources

Impacts to public safety. Public safety would be impacted under this alternative. Burros cause a public-safety hazard along several roads within the recreation area. Under this alternative, burro use in these areas would continue to cause a public-safety hazard. Deaths, injuries, and property damage could occur resulting from vehicular collisions with burros on public roads.

Impacts to recreation. Those visitors wishing to view burros within the recreation area would benefit from the decision to continue the status quo, while those visitors who want burros to be removed would be affected adversely.

Burros along the shorelines produce negative impacts to public recreation through trampling and fecal contamination. Burro use in camping areas, especially backcountry sites, would continue, resulting in negative impacts by fecal contamination, noise pollution, and property damage. As burro populations increase, it is likely that in the future there would be a reduction of campsites that are unimpacted by burros.

A minor amount of short-term visual impact and noise pollution would occur from the use of helicopters in removal operations. The period of the highest visitation to the lakes is from May through September. Most capture operations would take place from fall through spring, therefore, most visitors would not be impacted from helicopter noise.

Backcountry visitors in the park could be impacted the most from helicopter operations. During the 2 to 7 day operations which would occur approximately 5 times per year, a small amount of backcountry visitors could be impacted from the noise and sight of the helicopter. These impacts would be short-term and minimal.

Impacts to livestock grazing. Livestock operations within Lake Mead NRA would be negatively impacted under this alternative. Burros would continue to degrade range conditions, which could eventually result in the reductions of permitted numbers, or closures of grazing allotments, in areas that burros use.

Conclusion

Visitors would be able to view burros within the recreation area. Burros utilizing the shorelines would continue to produce negative impacts to public recreation through trailing and fecal contamination. Burros that congregate along the roadways would continue to create a public safety hazard in these areas. Noise from capture operations could cause minimal short-term impacts to the visitor. Range conditions would continue to deteriorate from burro impacts and could result in the reduction of permitted numbers, or closures of grazing allotments in areas that burros utilize.

Cultural Resources

Impacts to archeological and historical resources. At present, no known archeological or historic sites have been affected by burros. Archeological and historical sites would be subject to potential burro impacts, including trampling and wallowing by burros under this alternative. As the present condition and locations of all archeological resources within the park are largely unknown, the magnitude of this impact cannot be described. However, as burro populations increase and expand their range, the long-term cumulative effects on cultural resources would likely be negative.

Conclusion

Cultural resources would be subject to potential burro impacts.

Burros

Impacts to burros. A negative impact to burros would be expected during removal operations. This would result from the stressful effects of capturing, handling, loading, and hauling the animals.

The long-term cumulative effects on free-roaming burro populations in the Southwest would be negative as burros continue to be removed from park lands and placed in adoption programs.

Conclusion

Removal operations could result in negative impacts to burros. Continued removal operations within the recreation area would result in a decreased free-roaming burro population in the Southwest.

ALTERNATIVE B: PROPOSED ACTION RESOURCE BASED MANAGEMENT

The goal of this alternative is to reduce the burro population within the recreation area to zero. However, it is not feasible at this time to remove burros from all use areas in the park, and prevent burros from crossing from BLM lands onto NPS lands. This plan establishes criteria for zero-burro-use areas, and NPS prescriptions for burro use in areas where total removal is not practical. The plan also establishes a framework to implement fencing, or other burro control measures, should they prove feasible.

Impacts from burros under this alternative would be eliminated in areas where burro populations would be reduced to zero. Impacts would be greatly reduced in areas where burros would remain. These areas would be closely monitored to assure minimal impacts from burro use.

Natural Resources

Impacts to soils. Areas of burro use that presently exhibit soil erosion above that of a normal desert ecosystem would be positively impacted because of the reduction or elimination of burros and decreased trampling effects. In areas where burro populations would be eliminated, burro trails would no longer be used. Loss of soils from newly created trails and wallows by wind erosion would cease and would be reduced over time on existing trails as the soils regain protection. Desert pavement and microfloral crusts would retain silt particles now lost by wind erosion. No new burro trails or widening of current trails would occur in areas where burro populations are eliminated. As soil recovery is extremely slow in the desert environment, trails would remain visible for a long time. An accelerated rate of wind and water erosion would continue until native vegetation is reestablished in these areas.

In areas where burro populations are reduced to NPS prescriptions, impacts to soils by burros would be reduced, although minimal impacts would continue until the time that burro populations could feasibly be eliminated from the recreation area.

Construction and operation of traps and holding corrals as a result of the proposed action would cause disturbance to the vegetation. However, these disturbances would be minimal since traps would be located in previously disturbed areas or in sandy or gravel wash bottoms. Therefore, effects would be minimal and short term, and all signs of the capture operation would be eliminated when water runs through the wash or after soil reclamation or rehabilitation. Following project completion and removal of traps and corrals, disturbed areas would be slow to recover, and exotic vegetation may invade those areas until native plants become well established and can outcompete exotic species.

The reduction in burro numbers under the proposed action and the resultant reduction in vegetation utilization would, over the long term, increase plant cover and improve vegetative biodiversity, and lessen the amount of soil lost to erosion.

Impacts to vegetation. The reduction of burro populations in specified areas of the park, and the elimination of burros in all other areas of the park, would help prevent further deterioration of the range. Removing burros would result in positive, long-term impacts to the vegetative community. The ecological condition of different plant communities would improve after burros are removed or their populations are reduced. Loss of biodiversity in areas of burro use due to burro impacts would not occur. The diversity of plant species currently impacted from burros would eventually return to standards that existed prior to burro utilization.

Vegetation would not recover immediately even in areas where burro populations would be eliminated. Recovery of vegetation in a desert ecosystem may take many years. Depending upon the availability of seeds, exotic invader species or native plants may reestablish in the area. Exotic or invasive species may be the first to return to bare areas. Eventually, these species would be replaced by native species. Grasses and forbs would be expected to return to the area first, followed by shrubs if local seed sources are present.

In areas where burros would remain under this alternative, there would continue to be impacts to vegetation. It is likely that through NPS prescriptions, that impacts to vegetation would be minimal.

There may be short-term negative impacts to the vegetation at the trap locations and holding corrals. The vegetation would be severely trampled by the burros that would be concentrated at these locations. However, in most circumstances, locations of traps and corrals would be limited to washes and previously disturbed sites. Impacts would be minimal, and if necessary, the site would be rehabilitated and/or reseeded.

Fencing in some areas of the park could impact the vegetation. Plants may need to be removed to clear fence lines. Cactus would be salvaged prior to fence construction, however, shrubs, forbs, and grasses may be negatively impacted. Fencing would lead to movement along fencelines by burros resulting in trails adjacent to the fence.

Impacts to wildlife. Under this alternative, elimination or reduction of burros *should* reduce competition for forage and result in a beneficial impact to bighorn sheep, desert tortoise, and other wildlife populations. Reduced use on the shores of Lake Mead should benefit a large number of wildlife species which utilize riparian vegetation for nesting, resting, and foraging.

The removal of burros would increase available forage in areas currently overutilized by burros. The amount and type of native vegetation that would eventually be reestablished in areas where burros remain is unknown; however, an increase in grasses would be expected, and reseeding and planting may increase forage in some areas.

An increase in forage species would reduce stress on existing bighorn sheep herds, particularly around springs where bighorn and burros compete for emergency food supplies. Grasses, forbs, and shrubs that are currently utilized by burros would increase when burros are removed, resulting in an increase in plant species preferred by bighorn sheep.

Small mammals would benefit from increased seeds, grasses, and other plant materials as vegetation slowly recovers. Birds would benefit from the return to natural abundance of grasses and seed plants. Predators, including birds of prey, would benefit from the renewal of the small mammal populations. Wildlife populations would eventually achieve a natural level of population numbers and diversity in balance with the food supply.

The removal of burros from riparian areas, including springs, would decrease the damage to these areas by burros due to foraging, trampling, and trailing. These water sources would return to natural conditions.

The removal operations would have no permanent impact on native wildlife. Direct ephemeral disturbances would be caused by management personnel moving through or conducting capture operations in the home range of some species. Burro traps would not be placed in critical wildlife areas. They could, however, catch native animals like bighorn sheep. Traps would be monitored closely to ensure that native animals are not captured, or if they are, that the animals would be released quickly.

Capture operations utilizing helicopters could cause impacts to wildlife from noise. The noise of a helicopter in the removal area could cause wildlife to temporarily relocate. These impacts are short-term in nature. Wildlife would move back into the area after capture operations have ceased.

Fence construction would disrupt wildlife with noise, habitat disturbance and physical obstruction. The construction of fences may cause wildlife to temporarily leave their home ranges, and may cause amended movement patterns, however, these species would adjust to the fences and eventually return to the disturbed areas. Fencing would prevent burros from crossing into park boundaries from BLM lands, and would allow NPS

managers to protect critical resource areas from burro impacts. The reduction of impacts to the habitat would benefit wildlife.

Bighorn may inhabit some areas that would be fenced. However, fences would be constructed to allow the passage of bighorn and would be monitored to insure safety and effectiveness.

Impacts to threatened and endangered species. The removal of burro populations from areas of known threatened, endangered or candidate species would have long-term benefits to these species by improving habitat conditions.

One species that could benefit from the removal of burros is the desert tortoise (*Gopherus agassizii*). The desert tortoise inhabits areas which burros are known to impact. The removal of burros from these areas would increase the amount of forage available to the desert tortoise.

Effects of burro activity on rare plants is not well documented, however, it can be expected that those species occurring within burro range are subject to the effects of burro use such as browsing, selected removal, and trampling. Removal of burros would relieve these species from possible burro impacts and may allow numbers to increase. Burro use and trailing in gypsum areas increases erosion and, therefore, causes a loss of habitat, reducing the diversity of species within the park. Removal of burros would lessen soil loss and habitat loss for these species.

Some capture operations would be in areas where sensitive, threatened or endangered species might possibly occur. Capture sites would be surveyed by NPS specialists prior to any removal operations. Care would be taken to avoid harming these species, and traps and corrals would not be placed in areas where threatened, endangered, or candidate species are present.

Impacts to water resources. Reduction of burro populations would end the foraging, trampling and fecal contamination impacts around the lakeshore and springs within areas of burro use, including Corral, Scirpus, Blue Point, Rogers, and Aztec Springs, where burro use would be eliminated. Removal of burro impacts from riparian areas within the park would eventually permit natural processes to improve the water quality. Removal of burros may also increase the amount of available surface water, especially at small springs and seeps.

Long-term cumulative effects on park water quality are expected to be positive. Soil erosion caused by burro trailing, trampling, and soil compaction would decrease in areas of burro use, resulting in soil stabilization, less runoff, erosion, and sedimentation in drainage areas. There would be less fecal contamination by burros. Water quality in downslope springs and in portions of the lakes would improve.

In park areas where burro populations would be managed to NPS prescriptions, impacts to water resources would be reduced. However, some springs would continue to be impacted by burro use.

Impacts to visual resources. The quality of visual resources in areas where burro populations are reduced or eliminated would not improve immediately. Long-term cumulative impacts are expected to be beneficial in areas that burros are eliminated as burro trailing and trampling is eliminated and vegetation is reestablished. In areas that burros would be managed to NPS prescriptions, some trailing would continue to impair the visual resource.

Fencing actions under this alternative have a potential negative impact to visual resources.

Impacts to air quality. Increased vegetative cover due to decreased grazing and trampling by burros would result in cumulative, long-term benefits by reducing the amount of wind borne particulates generated from erosion in areas of burro use. Soil stabilization, as a result of decreased erosion, recovery of desert pavement and microfloral crusts, would decrease the amount of dust and fine soils dispersed by winds. This decrease would cause a minor beneficial impact on air quality over the long term.

Short-term increases in transient dust levels caused by the operation of ground vehicles, running burros, and helicopter use would occur during captures. Short-term, localized impacts to air quality would occur during capture operations and handling of burros resulting from helicopter and vehicular exhaust fumes. These actions are not expected to significantly affect the air quality in the recreation area.

Conclusion

Impacts from burros to natural resources would be eliminated or minimized under this alternative. Soils in areas where burro populations would be eliminated would be positively impacted by decreased trampling impacts. Impacts to soils would be reduced in areas where burros remain and are managed to NPS prescriptions. The removal or reduction of burro populations would prevent further deterioration of native vegetation, and in areas where burros would be eliminated, vegetation could eventually approach its potential natural community. Fencing in areas of the park would cause a negative impact to some vegetation during the construction phase. Forage would increase, habitat would improve, and wildlife would benefit. Fence construction would have short-term impacts on wildlife species. As habitat conditions improve under this alternative, threatened, endangered and candidate species would benefit. The reduction or elimination of burro populations would permit natural processes to improve the water quality in riparian areas. The quality of the visual landscape would eventually improve as burro trails are replaced by native vegetation. Increased vegetative cover and decreased trampling by burros would lessen soil erosion resulting in a minor beneficial impact to air quality.

Socioeconomic Resources

Impacts to public safety. Burros would be removed in areas where they cause a public safety hazard, therefore, the potential hazard from burros would be reduced. Most capture sites would be located away from congested public-use areas and should not affect public safety. If a removal must take place at or adjacent to a busy area, and if determined necessary, traffic control would be set up during the time of the operations so if burros run across roads, or through busy areas, the likelihood of an accident caused by burro removal operations would be reduced.

Impacts to public outdoor recreation. The removal of burros along the lakeshores would decrease the concentration of burro droppings and trampling along the shoreline. As long term recovery takes place in these areas, the prime recreation use area environment would be enhanced.

People would have less opportunity to view burros within the recreation area under the proposed action. But, due to the long-term nature of this plan and the realization that some burro use would continue to occur within the park, there still would be some burros to view within the recreation area into the foreseeable future.

People who want to see or study Lake Mead NRA ecosystems in natural conditions, or those concerned about the survival of native wildlife, would be appeased when burros are removed or reduced within Lake Mead NRA.

Trapping of burros would provide people the opportunity to adopt and care for a burro.

A minor amount of short-term visual impact and noise pollution would occur from the use of helicopters in removal operations. The period of the highest visitation to the lakes is from May through September. Most capture operations would take place from fall through spring, therefore, most visitors would not be impacted from helicopter noise.

Backcountry visitors in the park could be impacted the most from helicopter operations. During the 2 to 14 day operations which would occur approximately 7 to 10 times per year within the first two years, with fewer operations after populations are removed or reduced, a small amount of backcountry visitors could be impacted from the noise and sight of the helicopter. These impacts would be short-term and minimal.

Impacts on livestock grazing. Burro use areas overlap with areas of limited livestock grazing (Appendix G). The removal of burros from areas of active livestock grazing would have beneficial impacts to livestock operations. Long term cumulative impacts from burro removals would result in improved range conditions and an increase in desirable forage plants. The NPS would not be forced to close or reduce grazing allotments due to burro damage.

Conclusion

The removal of burros from areas where they pose a public safety hazard would reduce this hazard. As burro impacts are reduced or eliminated along the shoreline, the prime recreation use area environment would be enhanced. People would have less opportunities to view burros within the recreation area. There would be minor, short-term impacts from helicopter use in capture operations. The removal of burros from areas of active livestock grazing would result in improved range conditions and an increase in desirable forage plants.

Cultural Resources

Impacts on archeological and historical resources. At present, no known archeological or historic sites have been affected by burros, and no adverse effect on cultural resources is expected as a result of the proposed action. The removal or reduction of burro populations within the recreation area would reduce potential damage to archeological and historical sites, by burros, within areas of burro use.

In areas where burros remain under NPS prescriptions, there is the potential that burros could impact cultural or historic resources. As the present condition and locations of all cultural resources within the park are largely unknown, it is impossible to determine the impact remaining burros would have on these resources.

Fences, traps, and corrals would be sited so to have no effect on historic properties. The evaluation of cultural resources would be done in compliance with Section 106 of the National Historic Preservation Act. If a trap or fence is proposed in a cultural site, an alternative location would be chosen. If any evidence of cultural resources is found during the operation, a cultural resource specialist would immediately be called in for evaluation.

Conclusion

The removal or reduction of burro populations within the recreation area would reduce the potential damage by burros to cultural sites. However, the potential of damage to these sites would remain in areas that burros would be managed to NPS prescriptions. As present conditions and locations of cultural resources are largely unknown, impacts cannot be determined.

Burros

Impacts on burros. A negative impact to burros would be expected during the removal operation. This would result from the stressful effects of capturing, handling, loading, and hauling the animals.

It is unlikely that a jenny would abandon her foal during the removal operations. Foals are rarely orphaned by capture operations. Minor stress may be associated with splitting of bands.

Few burros would be expected to be injured in the removal operations. Injuries, such as burros running into the trap or being kicked by another burro, may occur when the animal is roped or trapped. Death may occur during the removal operations, but it would be rare, and every effort would be made to prevent this. The standard operating procedures would minimize negative impacts for the captures and ensure humane treatment and safe handling of the burros during the capture, care, and transportation.

Burros that are adopted out would receive better food and care than burros, and water stress problems would be eliminated.

Burros that remain within the recreation area would experience a reduced level of intraspecific and interspecific competition, which would result in a less stressful environment. Reduction of burros in other areas has resulted in increased natality among remaining burros. Burros that remain would be managed closely in order to ensure that burros do not re-populate burro-free zones or overpopulate burro management zones.

Under this alternative, the reduction or removal of burros from the recreation area, and the fencing of specific areas of the park, could have direct or indirect effects, both short and long term, to burro populations that the BLM wishes to maintain on adjacent BLM lands. These impacts have not been fully studied, therefore they cannot be addressed at this time. However, cooperation between the NPS and the BLM to conduct research on burro distribution and movement patterns has been proposed. This research would determine the extent which burros travel between BLM administered lands and Lake Mead NRA and the water sources burros utilize on both NPS and BLM lands. As these studies area completed, knowledge would be gained on how this alternative would effect burro populations on adjacent lands and what mitigating measures would be necessary to minimize these effects.

Long-term cumulative impacts to burro populations in the Southwest would occur under this alternative. As burro populations are removed from the recreation area, and placed in adoption facilities, there would be reduced populations of free-roaming burros within the Southwest.

Conclusion

A negative impact to burros would be expected during removal operations. Burros that are adopted out would receive better care. Burros that remain within the recreation area would experience a reduced level of competition. Free-roaming burro populations in the Southwest would be reduced as burros are removed from the recreation area.

ALTERNATIVE C: NO MANAGEMENT

This alternative would have the same impacts to the natural, socioeconomic, and cultural resources as alternative A except that impacts would be intensified, and the burro population could suffer long-term negative impacts.

Natural Resources

Impacts to soils. Under this alternative, the burro population would increase and expand its range. This would cause continued and increased negative impact to soils. As the burro population expands its range, impacts would extend into previously unimpacted areas.

Compaction and trailing would increase and would spread as the burro population expands its range. Enlargement of the existing trails, extension of trails to new areas, soil compaction, soil erosion and decreased soil productivity would be the primary impacts, resulting in decreased vegetative cover, plant establishment and biodiversity. Desert pavement, microfloral crusts made up of living organisms (cryptogamic crusts) and gypsum soils would be severely impacted by burro trampling.

Cumulative impacts would result in long-term negative impacts to the soils within areas of burro use. Soil disturbance in these areas would eventually change the natural condition of the soils, resulting in a loss of soil structure and decreased plant establishment.

Impacts to vegetation. The uncontrolled increase of the burro population, approximately 20 percent per year, would cause additional disturbance to native vegetation. Burros would continue to deplete vegetation in areas they currently inhabit. Burro populations have impacted specific plant species so heavily in certain areas of burro use that these species are no longer viable. If burro use were intensified in these areas, these plant species could be expected to be completely decimated, resulting in a decrease of biodiversity. Burro populations would expand into previously uninhabited areas and would impact vegetation in those areas by trampling or browsing. A decrease in forbs, shrubs, and grasses in areas that burros use would occur under this alternative.

Burros would continue to graze on the palo verde stand in the Fire Mountain area of the park. Left unmanaged, burros would irreparably damage this unique park resource. Long-term cumulative impacts from burro use on palo verde could eventually result in the destruction of this resource.

As vegetation is depleted, overgrazed areas would expand in size, eventually resulting in the depletion of vegetation in areas that burros utilize.

Impacts to wildlife. A no-management alternative would allow the burro population to increase in size and expand into previously uninhabited areas. This would result in overgrazed areas that would decrease forage and cover for wildlife, which could lead to a decrease in the diversity of wildlife species.

Increased burro use of bighorn habitats, food plants, and water sources would result in stress to bighorn populations and may lead to reductions in their population sizes and viability. Depletion of forbs and shrubs may lead to changes in densities, species composition and diversity of small mammal communities in areas with burros. The impact by burros to the habitat would increase and become more widespread as the burro population grows and expands its range.

These impacts are long-term and cumulative. As burro populations expand, further deterioration of the habitat would be expected.

Impacts to threatened and endangered species. The depletion of forbs, shrubs, and grasses in burro areas, the expansion of burro populations, and the subsequent establishment of non-native annual vegetation, may cause a decline in desert tortoise populations, which depend on forbs and grasses as a food source. Shrub cover would be reduced further reducing the suitability of many areas as desert tortoise habitat. As burro populations increase and expand into previously undisturbed areas, they would further impact desert tortoise populations by depleting habitat requirements.

Candidate species of plants are located in burro areas. These species could be detrimentally impacted by trampling and habitat loss if burro use in their habitat continues and grows. Impacts to the habitat, by burros, could negatively effect these species and could cause a decrease in biodiversity.

Impacts to water resources. Under this alternative, degradation of springs and riparian areas within burro areas would continue and increase. Degradation by burros includes trampling and grazing vegetation in these areas. Water quality would continue to deteriorate due to burro feces and urine in and around the water, and soil erosion. Springs and riparian areas into which burro populations expand would deteriorate, and the water would eventually become muddy and polluted.

Water quality may be impacted in Lakes Mead and Mohave in burro areas and expansion areas, especially in coves, due to fecal contamination and soil erosion.

Long-term cumulative impacts would be expected to be negative, resulting in increased deterioration of springs, riparian habitats, and water quality where burro use would continue, increase, and expand.

Impacts to visual resources. Burros would continue to impair visual resources through various means including trailing, trampling and grazing vegetation to near depletion. The results in a scarred landscape. This impact would continue and increase into previously unscathed areas under this alternative. The impact to visual resources is long-term and cumulative, due to the slow recuperation of arid environments.

Impacts to air quality. Long-term air quality may deteriorate if burro populations are allowed to multiply and spread. Erosion of desert pavement and cryptogamic crusts made up of fungi and lichens would severely increase in burro areas and would increase the amount of sand and light soil particles in the air caused by wind erosion.

Conclusion

This alternative would have negative impacts on park natural resources. Detrimental effects to soils as a result of burro trampling and trailing would continue and expand. Burro populations would continue to deplete vegetation in areas they currently inhabit, and these impacts would augment as burro populations increase and expand. Vegetation depletion results in habitat deterioration, and would negatively impact wildlife populations. Threatened, endangered, and candidate species of plants and animals would be negatively impacted by the loss of habitat. Water resources would deteriorate as burros continue to muddy and pollute springs and riparian areas. Visual resources would be impacted by trailing and depletion of vegetation, and these impacts would expand as burro populations increase. Erosion of soils by burro use would continue to create an increase in particulates in the air.

Socioeconomic Environment

Impacts to public safety. Burro populations in areas around the roadways in the recreation area would increase under this alternative. Burros congregate along the roadways and browse on the vegetation that grows there. There would be an increase in burro-related motor vehicle accidents under this alternative. As burro populations expand, public safety would be negatively impacted.

Impacts to public outdoor recreation. Under this alternative, the quality of the visitor's experience may be adversely affected. The effects of the continuing and expanding burro population, including deterioration of the vegetation, wildlife, trailing, soil erosion and deteriorating water quality would adversely affect the quality of the visitor's experience.

Those who want to view burros within the recreation area would receive short-term benefits by a decision not to manage the burro population. However, burros would eventually reach a population level that could not be supported by the Lake Mead NRA environment, and it is likely that many would die from starvation. The viewing of dying and dead burros would have adverse impacts on park visitors. Those visitors who want burros to be removed would be affected adversely.

Impacts on livestock grazing. Livestock operations within Lake Mead NRA would be negatively impacted under this alternative. Burros would continue to degrade range conditions, and expand into previously unimpacted areas, which could result in the reductions of permitted numbers or closures of grazing allotments in areas of burro use.

Conclusion

The quality of the recreation experience would be detrimentally impacted by expanding burro populations and impacts. Public safety would be impaired by burros congregating along the roadways. Livestock operations would be negatively impacted as range conditions continue to deteriorate from burro use.

Cultural Resources

Impacts on archeological and historical resources. Archeological and historical sites would be subject to trampling and wallowing by burros under this alternative. At the present, condition and locations of all archeological resources within the park are largely unknown, thus, the magnitude of this impact cannot be described. However, the majority of cultural and historical sites within the park are largely surface sites with little or no depth. Riparian and spring communities, where burros may congregate, often have higher cultural site densities. As burro populations increase and expand their range, the potential to significantly damage cultural sites increases, and the long-term cumulative effects on cultural resources would likely be negative.

Conclusion

As burro populations expand their range and increase in numbers, the potential to damage archeological and historical sites increases.

Burros

Impacts to burros. The no-management alternative would allow the burro population to expand unchecked. Although at first the burro population would thrive, eventually, after range conditions have deteriorated, the burro population would face starvation, increased incidence of disease, and death.

Conclusion

The burro population could suffer long-term detrimental impacts through deteriorated range conditions which could lead to starvation, increased incident of disease, and death.

ALTERNATIVE D: MANAGING A POPULATION OF BURROS WITHIN THE PARK FOR PERPETUITY

This alternative is similar to the alternative B in that burros would be managed within the recreation area to NPS prescriptions. However, the goal of this alternative is to keep a population of burros within the recreation area, even if new technology is developed that would permit the reduction of burro populations to zero.

This alternative would require a change in NPS policy towards the management of exotic species within the park. This alternative would require long-term burro management and funding and would include periodic reduction activities, burro surveys, monitoring and construction and maintenance of fences.

Reduction activities, surveys, and monitoring would be necessary to regulate burro populations. Burro populations have exhibited the capacity to recruit young animals into the population at rates which approach, and even exceed, 20 percent per year (Ruffner et al. 1977, Woodward 1976, National Advisory Board Report 1990). For this reason, burro populations must be periodically monitored, and reduction activities must take place in order to regulate burro numbers and control burro impacts.

Without consistent and intensive management of burros, resources in areas that have continued burro use would not be able to recover from burro impacts. Extensive fencing would be required around burro areas, and would impact the area. Also, even though fencing the area would limit the burro range, there is no way to ensure that burros could not get through the fences. Burros that are able to get through the fencing could go on to re-populate areas and cause impacts that are discussed in alternatives A and C.

Natural Resources

Impacts to soils. Areas of burro use that presently exhibit soil erosion above that of a normal desert ecosystem would be positively impacted in areas where burro populations are reduced to zero because trampling effects would be eliminated. Burro trails would no longer be used as burro numbers are eliminated. Loss of soils from newly created trails and wallows by wind erosion would cease and would be reduced over time on existing trails as the soils regain protection. Desert pavement and microfloral crusts would retain silt particles now lost by wind erosion. No new burro trails or widening of current trails would occur where the burro populations are reduced to zero. As soil recovery is extremely slow in the desert environment, trails would remain visible for a long time. An accelerated rate of wind and water erosion would continue until native vegetation is reestablished in these areas.

In areas where burros remain, although populations would be reduced, there would be continued trampling effects from burros. Loss of soils from burro trails and wallows by erosion would continue even as burro populations are managed for minimal impacts.

These impacts would continue indefinitely as burros remain within the park. Maintaining a population of burros within the park for perpetuity would result in long-term cumulative impacts to soils in the limited areas in which burros would utilize.

Construction and operation of traps and holding corrals as a result of this alternative would cause disturbance to the vegetation. However, most traps would be located in previously disturbed areas or in sandy or gravel wash bottoms and effects would be minimal and short term, and all signs of the capture operation would be eliminated when water runs through the wash or after soil reclamation or rehabilitation. Following project completion and removal of traps and corrals, disturbed areas would be slow to recover, and exotic vegetation may invade those areas until native plants become well established and can outcompete exotic species.

The reduction in burro numbers under this alternative and the resultant reduction in vegetation utilization would increase plant cover and lessen the amount of soil lost to erosion.

Fencing areas of burro use would lead to movement along fencelines by burros resulting in trails adjacent to the fence.

Impacts to vegetation. The reduction of burro populations in specified areas of the park, and the elimination of burros in all other areas of the park, would help prevent further deterioration of the range. Removing burros would result in positive, long-term impacts to the vegetative community. The ecological condition of different plant communities would improve after burros are removed or their populations are reduced. Biodiversity of plant species in areas currently overutilized by burros could increase.

Vegetation would not recover immediately even in areas where burro populations would be eliminated. Recovery of vegetation in a desert ecosystem may take many years. Depending upon the availability of seeds, exotic invader species or native plants may reestablish in the area. Exotic or invasive species may be the first to return to bare areas. Eventually, these species would be replaced by native species. Grasses and forbs would be expected to return to the area first, followed by shrubs if local seed sources are present.

In areas where burros would remain under this alternative, there would continue to be impacts to vegetation. It is likely that through NPS prescriptions, that impacts to vegetation would be minimal. However, continued utilization of plant species by burros, for perpetuity, could eventually result in the deterioration of the plant community, and the loss of species diversity.

There may be short-term negative impacts to the vegetation at the trap locations and holding corrals. The vegetation would be severely trampled by the burros that would be concentrated at these locations. However, in most circumstances, locations of traps and

corrals would be limited to washes and previously disturbed sites. Impact would be minimal, and if necessary, the site would be rehabilitated and/or reseeded.

Fencing around areas of burro use could impact the vegetation. Plants may need to be removed to clear fence lines. Cactus would be salvaged prior to fence construction, however, shrubs, forbs, and grasses may be negatively impacted. Fencing would lead to movement along fencelines by burros resulting in trails adjacent to the fence.

Impacts to wildlife. Under the proposed action, elimination or reduction of burros should reduce competition for forage and result in a beneficial impact to bighorn sheep, desert tortoise, and other wildlife populations. Reduced use on the shores of Lake Mead should benefit a large number of wildlife species which utilize riparian vegetation for nesting, resting, and foraging.

The removal of burros would increase available forage in areas currently overutilized by burros. The amount and type of native vegetation that would eventually be reestablished in areas where burros remain is unknown; however, an increase in grasses would be expected, and reseeding and planting may increase forage in some areas, and could result in an increase in the diversity of wildlife species.

An increase in forage species would reduce stress on existing bighorn sheep herds, particularly around springs where bighorn and burros compete for emergency food supplies. Grasses, forbs, and shrubs that are currently utilized by burros would increase when burros are removed, resulting in an increase in plant species preferred by bighorn sheep.

Small mammals would benefit from increased seeds, grasses, and other plant materials as vegetation slowly recovers. Birds would benefit from the return to natural abundance of grasses and seed plants. Predators, including birds of prey, would benefit from the renewal of the small mammal populations. Wildlife populations would eventually achieve a natural level in balance with the food supply.

The removal of burros from riparian areas, including springs, would decrease the damage to these areas by burros due to foraging, trampling, and trailing. These water sources would return to natural conditions and become available to wildlife after burros are removed.

Under this alternative, burros would be managed for minimal impacts in specific areas of the park, for perpetuity. Even under stringent management guidelines, burro utilization of park resources, for perpetuity, could result in the deterioration of habitat. This impact is long-term and cumulative and could result in a decline in wildlife populations and diversity.

The removal operations would have no permanent impact on native wildlife. Direct ephemeral disturbances would be caused by management personnel moving through or conducting capture operations in the home range of some species. Burro traps would not be placed in critical wildlife areas. They could, however, catch native animals like bighorn sheep. Traps would be monitored closely to ensure that native animals are not captured, or if they are, that the animals would be released quickly.

Capture operations utilizing helicopters could cause impacts to wildlife from noise. The noise of a helicopter in the removal area could cause wildlife to temporarily relocate. These impacts are short-term in nature. Wildlife would move back into the area after capture operations have ceased.

Fence construction would disrupt wildlife with noise, habitat disturbance and physical obstruction. The construction of fences may cause wildlife to temporarily leave their home ranges, and may cause amended movement patterns, however, these species would adjust to the fences and eventually return to the disturbed areas. Fencing would prevent burros from crossing into park boundaries from BLM lands, and would allow NPS managers to protect critical resource areas from burro impacts. The reduction of impacts to the habitat would benefit wildlife.

Bighorn may inhabit some areas that would be fenced. However, fences would be constructed to allow the passage of bighorn and would be monitored to insure safety and effectiveness.

Impacts to threatened and endangered species. Burros would be removed from areas of known threatened, endangered, or candidate species. The removal of burros from these areas would have long-term benefits to candidate, threatened, and endangered species by improving habitat conditions.

One species that could benefit from the removal of burros is the desert tortoise (*Gopherus agassizii*). The desert tortoise inhabits areas which burros are known to impact. The removal of burros from these areas would increase the amount of forage available to the desert tortoise.

Effects of burro activity on rare plants is not well documented, however, it can be expected that those species occurring within burro range are subject to the effects of burro use such as browsing, selected removal, and trampling. Removal of burros would relieve these species from possible burro impacts and may allow numbers to increase. Burro use and trailing in gypsum areas increases erosion and, therefore, causes a loss of habitat. Removal of burros would lessen soil loss and habitat loss, and could result in the return to the natural diversity of these species.

Some capture operations would be in areas where sensitive, threatened or endangered species possibly occur. Capture sites would be surveyed by NPS specialists prior to any

removal operations. Care would be taken to avoid harming these species, and traps and corrals would not be placed in areas where these species are present.

Impacts to water resources. Reduction of burro populations would end the foraging, trampling and fecal contamination impacts around the lakeshore and springs within areas of burro use, including Corral, Scirpus, Blue Point, Rogers, and Aztec Springs. Removal of burro impacts from riparian areas within the park would permit natural processes to eventually improve the water quality. Removal of burros may also increase the amount of available surface water, especially at small springs and seeps.

Long-term cumulative effects on park water quality are expected to be positive in areas where burro populations are eliminated. Soil erosion caused by burro trailing, trampling, and soil compaction would decrease where burro populations are reduced to zero, eventually resulting in soil stabilization, less runoff, erosion, and sedimentation in drainage areas. Water quality in downslope springs and in portions of the lakes would improve.

In park areas where burro populations would be managed to NPS prescriptions for perpetuity, burro impacts to water resources would be reduced. However, some springs would continue to be impacted by burro use, resulting in the continued deterioration of these water sources. Fencing areas of these springs to allow for restoration and recovery could occur in order to minimize these impacts.

Impacts to visual resources. The quality of visual resources in areas where burro populations are reduced or eliminated would not improve immediately. Long-term cumulative impacts are expected to be beneficial as burro trailing and trampling is reduced or eliminated and vegetation is reestablished.

In areas where burros would remain under NPS prescriptions, burro trailing would continue to impact visual resources. Although these impacts would be reduced, it is likely that long-term cumulative impacts to the visual resource from burro trailing would occur as a result of unending burro use.

Impacts to air quality. Increased vegetative cover due to the elimination or decrease of grazing and trampling by burros would result in cumulative, long-term benefits by reducing the amount of wind borne particulates generated from erosion in areas of burro use. Soil stabilization, as a result of decreased erosion, recovery of desert pavement and microfloral crusts, would decrease the amount of dust and fine soils dispersed by winds. This decrease would cause a minor beneficial impact on air quality over the long term.

Short-term increases in transient dust levels caused by the operation of ground vehicles, running burros, and helicopter use would occur during captures. Short-term, localized impacts to air quality would occur during capture operations and handling of burros

resulting from helicopter and vehicular exhaust fumes. These actions are not expected to significantly affect the air quality in the recreation area.

Conclusion

This alternative would result in decreased impacts to natural resources. Trampling effects on soils would be reduced or eliminated. Soils would eventually recover where burro populations are eliminated. The removal or elimination of burros from the recreation area would allow the long-term recovery of vegetation. In areas where burros remain, some minimal impact to vegetation would continue. Long-term impacts from burro use could eventually result in deterioration of the plant community if management strategies prove unsuccessful. Wildlife should benefit from the reestablishment of vegetation and the improvement to habitat. Burros would be removed from areas of known threatened, endangered, or candidate species, and these species should benefit. Water resources, visual resources, and air quality would benefit from decreased burro impacts.

Socioeconomic Resources

Impacts to public safety. Burros would be removed in areas where they cause a public safety hazard, therefore, the hazard from burros could be reduced. Most capture sites would be located away from congested public-use areas and should not affect public safety. If a removal must take place at or adjacent to a busy area, and if determined necessary, traffic control would be set up during the time of the operations so if burros run across roads, or through busy areas, public safety should be ensured.

Impacts to public outdoor recreation. The removal or reduction of burros along the lakeshores would decrease the concentration of burro droppings and trampling along the shoreline, enhancing the opportunities for recreational use.

People would have less opportunity to view burros within the recreation area under the this alternative. But, because some burro use would continue to occur, there still would be burros to view within the recreation area.

People who want to see or study Lake Mead NRA ecosystems in natural conditions, or those concerned about the survival of native wildlife, would be somewhat appeased when burros are removed from some areas of Lake Mead NRA. However, because burros would continue to exist in certain areas of the park, these people would not be entirely appeased.

Trapping of burros would provide people the opportunity to adopt and care for a burro.

A minor amount of short-term visual impact and noise pollution would occur from the use of helicopters in removal operations. The period of the highest visitation to the lakes

is from May through September. Most capture operations would take place from fall through spring, therefore, most visitors would not be impacted from helicopter noise.

Backcountry visitors in the park could be impacted the most from helicopter operations. During the 2 to 14 day operations which would occur approximately 7 to 10 times per year, a small amount of backcountry visitors could be impacted from the noise and sight of the helicopter. These impacts would be short-term and minimal.

Impacts on livestock grazing. Burro use areas overlap with areas of limited livestock grazing (Appendix G). The removal of burros from areas of active livestock grazing would have beneficial impacts to livestock operations. Burro removal would result in improved range conditions and an increase in desirable forage plants. The NPS would not be forced to close or reduce grazing allotments due to burro damage in areas where burro populations are reduced or eliminated.

Conclusion

The public safety hazard that burros create along park roadways would be reduced. The removal or reduction of burro populations along the lakeshores would decrease concentrations of burros, thus reducing negative impacts to the recreation resource. Improved range conditions from the removal or reduction of burros would benefit livestock grazing.

Cultural Resources

Impacts on archeological and historical resources. At present, no known archeological or historic sites have been affected by burros. The removal of burro populations within the recreation area could prevent potential damage to archeological and historical sites, by burros, within areas of burro use.

In areas where burros would be managed for perpetuity, there is the potential that burros could impact cultural or historic resources. Most cultural sites within Lake Mead NRA are surface sites, and burro trails and wallowing are potential threats to these sites. The present condition and locations of all cultural resources is largely unknown, it is impossible to determine the impact remaining burros would have on these resources.

Fences, traps, and corrals would be cited so to have no effect on historic properties. The evaluation of cultural resources would be done in compliance with Section 106 of the National Historic Preservation Act. If a trap or fence is proposed in a cultural site, an alternative location would be chosen. If any evidence of cultural resources is found during the operation, a cultural resource specialist would immediately be called in for evaluation.

Conclusion

The removal of burros would prevent potential damage to archeological and historic sites by burros within areas of burro use. In areas where burros remain to NPS prescriptions, burros could impact cultural sites.

Burros

Impacts on burros. A negative impact to burros would be expected during the removal operation. This would result from the stressful effects of capturing, handling, loading, and hauling the animals.

Few burros would be expected to be injured in the removal operations. Injuries, such as burros running into the trap or being kicked by another burro, may occur when the animal is roped or trapped. Death may occur during the removal operations, but it would be rare, and every effort would be made to prevent this. The standard operating procedures would minimize negative impacts for the captures and ensure humane treatment and safe handling of the burros during the capture, care, and transportation.

Burros that are adopted out would receive better food and care than burros, and water stress problems would be eliminated.

Burros that remain within the recreation area would experience a reduced level of intraspecific and interspecific competition, which would result in a less stressful environment. Reduction of burros in other areas has resulted in increased natality among remaining burros. Burros that remain would be managed closely in order to ensure that burros do not re-populate burro-free zones or overpopulate burro management zones.

Under this alternative, the reduction or removal of burros from the recreation area, and the fencing of specific areas of the park, could have direct or indirect effects, both short and long term, to burro populations that the BLM wishes to maintain on adjacent BLM lands. These impacts have not been fully studied, therefore they cannot be addressed at this time. However, cooperation between the NPS and the BLM to conduct research on burro distribution and movement patterns has been proposed. This research would determine the extent which burros travel between BLM administered lands and Lake Mead NRA and the water sources burros utilize on both NPS and BLM lands. As these studies are completed, knowledge would be gained on how this alternative would effect burro populations on adjacent lands and what mitigating measures would be necessary to minimize these effects.

Long-term cumulative impacts to burro populations in the Southwest would occur under this alternative. As burro populations are removed or reduced from the recreation area,

and placed in adoption facilities, there would be reduced populations of free-roaming burros within the Southwest.

Conclusion

Removal operations could result in a negative impact to burros. Burros that remain within the recreation area would experience a reduced level of competition. Populations of burros considered free-roaming within the Southwest would be reduced.

ALTERNATIVE E: TOTAL REMOVAL OF ALL BURROS

The impacts of this alternative would be the similar to the proposed action concerning the overall environmental quality of the recreation area, only burro use would be eliminated from the recreation area. The impacts from burros to natural, socioeconomic, and cultural resources, would be eliminated, resulting in long-term positive impacts to the habitat.

An intensive burro removal and fencing operation would be necessary in order to attempt to reduce the burro population to zero. An aggressive capture and removal program, possibly followed by a direct reduction program, would be implemented within the recreation area. Areas of the park adjacent to BLM lands would be fenced to prevent burros from crossing into the recreation area. Maintenance on fences would be necessary and an unending project. Even with these programs, it is unlikely that the population of burros could be reduced or maintained at zero, until more effective control methods are developed and implemented.

Natural Resources

Impacts to soils. Areas of burro use presently exhibiting soil erosion above that of a normal desert ecosystem would be positively impacted because of the elimination of burros and decreased trampling effects. Burro trails would no longer be used as burro numbers are eliminated. Loss of soils from newly created trails and wallows by wind erosion would cease and would be reduced over time on existing trails as the soils regain protection. Desert pavement and microfloral crusts would retain silt particles now lost by wind erosion. No new burro trails or widening of current trails would occur. Positive cumulative effects would occur over the long-term as soil recovery is extremely slow in the desert environment and trails would remain visible for a long time. An accelerated rate of wind and water erosion would continue until native vegetation is reestablished in these areas. As soil conditions improve, and native vegetation is reestablished, diversity of vegetative species may improve to conditions prior to that of burro utilization.

Construction and operation of traps and holding corrals as a result of this alternative would cause disturbance to the vegetation. However, most traps would be located in previously disturbed areas or in sandy or gravel wash bottoms. Therefore, effects would

be minimal and short term, and all signs of the capture operation would be eliminated when water runs through the wash or after soil reclamation or rehabilitation. Following project completion and removal of traps and corrals, disturbed areas would be slow to recover, and exotic vegetation may invade those areas until native plants become well established and can outcompete exotic species.

The long-term cumulative benefits from the elimination of burro populations and the resultant reduction in vegetation utilization would result in increased plant cover and decreased soil loss from erosion.

Impacts to vegetation. The elimination of burro populations in the park would help prevent further deterioration of the range. Removing burros would result in positive, long-term impacts to the vegetative community. The ecological condition of different plant communities would improve after burros are removed, and could result in an increase of plant diversity.

Vegetation would not recover immediately. Recovery of vegetation in a desert ecosystem may take many years. Depending upon the availability of seeds, exotic invader species or native plants may reestablish in the area. Exotic or invasive species may be the first to return to bare areas. Eventually, these species would be replaced by native species. Grasses and forbs would be expected to return to the area first, followed by shrubs if local seed sources are present. Long-term cumulative benefits are expected to occur to the vegetative communities from the elimination of burro impacts.

There may be short-term negative impacts to the vegetation at the trap locations and holding corrals. The vegetation would be severely trampled by the burros that would be concentrated at these locations. However, in most circumstances, locations of traps and corrals would be limited to washes and previously disturbed sites. Impact would be minimal, and if necessary, the site would be rehabilitated and/or reseeded.

Fencing in some areas of the park could impact the vegetation. Plants may need to be removed to clear fence lines. Cactus would be salvaged prior to fence construction, however, shrubs, forbs, and grasses may be negatively impacted. Fencing would lead to movement along fencelines by burros resulting in trails adjacent to the fence.

Impacts to wildlife. Under this alternative, the elimination of burros should reduce competition for forage and result in a beneficial impact to bighorn sheep, desert tortoise, and other wildlife populations. Elimination of burro use on the shores of Lake Mead should benefit a large number of wildlife species which utilize riparian vegetation for nesting, resting, and foraging. Species diversity may increase when habitat conditions eventually recover from burro impacts.

The removal of burros would increase available forage in areas currently overutilized by burros. An increase in grasses would be expected, and reseeding and planting may

increase forage in some areas. An increase in forage species would reduce stress on existing bighorn sheep herds, particularly around springs where bighorn and burros compete for emergency food supplies. Grasses, forbs, and shrubs that are currently utilized by burros would increase when burros are removed, resulting in an increase in plant species preferred by bighorn sheep and other wildlife.

Small mammals would benefit from increased seeds, grasses, and other plant materials as vegetation slowly recovers. Birds would benefit from the return to natural abundance of grasses and seed plants. Predators, including birds of prey, would benefit from the renewal of the small mammal populations. Wildlife populations would eventually achieve a natural population level and diversity in balance with the food supply.

The removal of burros from riparian areas, including springs, would decrease the damage to these areas by burros due to foraging, trampling, and trailing. These water sources would return to natural conditions and become available to wildlife after burros are removed.

The removal operations would have no permanent impact on native wildlife. Direct ephemeral disturbances would be caused by management personnel moving through or conducting capture operations in the home range of some species. Burro traps would not be placed in critical wildlife areas. They could, however, catch native animals like bighorn sheep. Traps would be monitored closely to ensure that native animals are not captured, or if they are, that the animals would be released quickly.

Capture operations utilizing helicopters could cause impacts to wildlife from noise. The noise of a helicopter in the removal area could cause wildlife to temporarily relocate. These impacts are short-term in nature. Wildlife would move back into the area after capture operations have ceased.

Fence construction would disrupt wildlife with noise, habitat disturbance and physical obstruction. The construction of fences may cause wildlife to temporarily leave their home ranges, and may cause amended movement patterns, however, these species would adjust to the fences and eventually return to the disturbed areas. Fencing would prevent burros from crossing into park boundaries from BLM lands, and would allow NPS managers to protect park areas from burro impacts. The elimination of impacts to the habitat would benefit wildlife.

Bighorn may inhabit some areas that would be fenced. However, fences would be constructed to allow the passage of bighorn and would be monitored to insure safety and effectiveness.

The impacts to wildlife from direct reduction activities are similar to impacts from removal operations, except that burro carcasses would provide a temporary food source

for scavengers, possibly causing a short-term increase in scavengers. It is unlikely that a permanent, abnormal abundance of scavengers would result from this alternative.

Impacts to threatened and endangered species. The removal of burros would have long-term benefits to candidate, threatened, and endangered species by improving habitat conditions.

One species that could benefit from the removal of burros is the desert tortoise (*Gopherus agassizii*). The desert tortoise inhabits areas which burros are known to impact. The removal of burros from these areas would increase the amount of forage available to the desert tortoise and could result in long-term cumulative benefits to tortoise populations within Lake Mead NRA.

Effects of burro activity on rare plants is not well documented, however, it can be expected that those species occurring within areas of burro use are subject to the effects of burros such as browsing, selected removal, and trampling. Removal of burros would relieve these species from possible burro impacts and may allow numbers and diversity to increase. Burro use and trailing in gypsum areas increases erosion and, therefore, causes a loss of habitat. Removal of burros would lessen soil loss and habitat loss for rare plants that depend upon gypsum soils.

Some capture operations would be in areas where sensitive, threatened or endangered species might possibly occur. Capture sites would be surveyed by NPS specialists prior to any removal operations. Care would be taken to avoid harming these species, and traps and corrals would not be placed in areas where these species are present.

Impacts to water resources. Elimination of burro populations would end the foraging, trampling and fecal contamination impacts around the lakeshore and springs within areas of burro use. Removal of burro impacts from riparian areas within the park would permit natural processes to improve the water quality. Removal of burros may increase the amount of available surface water, especially at small springs and seeps.

Long-term cumulative effects on park water quality are expected to be positive. Soil erosion caused by burro trailing, trampling, and soil compaction would be eliminated, resulting in soil stabilization, less runoff, erosion, and sedimentation in drainage areas. Water quality in downslope springs and in portions of the lakes would improve.

Impacts to visual resources. The quality of visual resources in areas where burro populations are eliminated would not improve immediately. Long-term cumulative impacts are expected to be beneficial as burro trailing and trampling is eliminated and vegetation is reestablished.

Impacts to air quality. Increased vegetative cover due to decreased grazing and trampling by burros would result in cumulative, long-term benefits by reducing the amount of wind borne particulates generated from erosion in areas of burro use. Soil stabilization, as a result of decreased erosion, recovery of desert pavement and microfloral crusts, would decrease the amount of dust and fine soils dispersed by winds. This decrease would eventually cause a minor beneficial impact on air quality.

Short-term increases in transient dust levels caused by the operation of ground vehicles, running burros, and helicopter use would occur during captures. Short-term, localized impacts to air quality would occur during capture operations and handling of burros resulting from helicopter and vehicular exhaust fumes. These actions are not expected to significantly affect the air quality in the recreation area.

Conclusion

Natural resources would benefit from the elimination of burros from the recreation area. Soils would eventually recover from burro trailing and trampling impacts, resulting in decreased soil loss and the reestablishment of native vegetation. As the vegetative communities recover, wildlife species would benefit from improved conditions. Candidate, threatened, and endangered species would benefit from the elimination of burros impacts within the recreation area. Water resources, visual resources, and air quality would improve as burro populations are eliminated.

Socioeconomic Resources

Impacts to public safety. Burros would be removed from areas where they cause a public safety hazard, therefore, the hazard from burros should be reduced. Accidents caused by burros and people viewing burros would decrease in the future when burro populations are eliminated. Most capture sites would be located away from congested public-use areas and should not affect public safety. If a removal must take place at or adjacent to a busy area, and if determined necessary, traffic control would be set up during the time of the operations so if burros run across roads, or through busy areas, public safety should be ensured.

Impacts to public outdoor recreation. The removal of burros along the lakeshores would decrease the concentration of burro droppings and trampling along the shoreline, enhancing the opportunities for recreational use. Long-term cumulative impacts would be the recovery of shorelines currently impacted by burros.

People would have no opportunity to view burros within the recreation area under this alternative.

People who want to see or study Lake Mead NRA ecosystems in natural conditions, or those concerned about the survival of native wildlife, would be appeased when burros are removed within Lake Mead NRA.

Trapping of burros would provide people the opportunity to adopt and care for a burro. A minor amount of short-term visual impact and noise pollution would occur from the use of helicopters in removal operations. The period of the highest visitation to the lakes is from May through September. Most capture operations would take place from fall through spring, therefore, most visitors would not be impacted from helicopter noise.

Backcountry visitors in the park could be impacted the most from helicopter operations. During the 2 to 14 day operations which would occur approximately 10 to 15 times per year until the population is removed, a small amount of backcountry visitors could be impacted from the noise and sight of the helicopter. These impacts would be short-term and minimal.

Should direct reduction be implemented, elimination of burros by shooting would disturb people who are opposed to killing burros. The observance of carcasses may offend backcountry users to the recreation area. However, the majority of visitors to the recreation area do not visit remote, backcountry areas. These impacts would be temporary and of relatively short duration.

Impacts on livestock grazing. Burro use areas overlap with areas of limited livestock grazing (Appendix G). The removal of burros from areas of active livestock grazing would have beneficial impacts to livestock operations. Burro removal would eventually result in improved range conditions and an increase in desirable forage plants. The NPS would not be forced to close or reduce grazing allotments due to burro damage.

Conclusion

The elimination of burros from the recreation area would reduce the hazard that burros create along the park roadways. Shoreline recreational opportunities would be enhanced by eliminating burro impacts to these resources. Range conditions would improve and would benefit livestock operations.

Cultural Resources

Impacts on archeological and historical resources. At present, no known archeological or historic sites have been affected by burros. The removal of burro populations within the recreation area would prevent potential damage to archeological and historical sites, by burros, within areas of burro use.

Fences, traps, and corrals would be cited so to have no effect on historic properties. The evaluation of cultural resources would be done in compliance with Section 106 of the

National Historic Preservation Act. If a trap or fence is proposed in a cultural site, an alternative location would be chosen. If any evidence of cultural resources is found during the operation, a cultural resource specialist would immediately be called in for evaluation.

There would be no cumulative impacts on cultural resources from this alternative.

Conclusion

The removal of burros from the recreation area would prevent potential damage to cultural resources.

Burros

Impacts on burros. A negative impact to burros would be expected during the removal operation. This would result from the stressful effects of capturing, handling, loading, and hauling the animals.

Few burros would be expected to be injured in the removal operations. Injuries, such as burros running into the trap or being kicked by another burro, may occur when the animal is roped or trapped. Death may occur during the removal operations, but it would be rare, and every effort would be made to prevent this. The standard operating procedures would minimize negative impacts for the captures and ensure humane treatment and safe handling of the burros during the capture, care, and transportation.

Burros that are adopted out would receive better food and care than at the park, and water stress problems would be eliminated.

Only qualified personnel would be used in direct reduction operations, should they become necessary, and stringent guidelines would be used to ensure a quick, humane death to the burros. The stress of pursuit would replace the stress of trapping, and the possibility of an inaccurate shot could result in a less-than-instantaneous death.

Under this alternative, the removal of burros from the recreation area, and the fencing of specific areas of the park, could have direct or indirect effects, both short and long term, to burro populations that the BLM wishes to maintain on adjacent BLM lands. These impacts have not been fully studied, therefore they cannot be addressed at this time. However, cooperation between the NPS and the BLM to conduct research on burro distribution and movement patterns has been proposed. This research would determine the extent which burros travel between BLM administered lands and Lake Mead NRA and the water sources burros utilize on both NPS and BLM lands. As these studies area completed, knowledge would be gained on how this alternative would effect burro populations on adjacent lands and what mitigating measures would be necessary to minimize these effects.

Long-term cumulative impacts to burro populations in the Southwest would occur under this alternative. As burro populations are removed from the recreation area, and placed in adoption facilities, or as burros are eliminated through a direct reduction program, there would be reduced populations of burros considered wild and free-roaming within the Southwest.

Conclusion

Burro populations could be negatively impacted from the removal operations. Fencing operations could have negative effects on burro populations on adjacent lands. Burro populations considered free-roaming would be reduced as burros are removed from the recreation area and placed in adoption facilities.

Unavoidable Adverse Impacts

Alternative A

The control methods under this alternative would cause short-term disturbances to native animals due to the use of helicopters, vehicles, and horses for the operations. Animals may either vacate the area during the operations, or seek protective cover.

Traps and corral construction, and the trampling and wallowing of burros in these areas, would cause the local disturbance of vegetation and soils. Invader species of plants could become established in these areas.

Short-term localized impacts to air quality would occur during capture and removal operations resulting from helicopter and vehicular exhaust fumes. Short-term increases in transient dust would occur due to vehicular traffic and burro movement.

Helicopter use during capture operations would cause short-term impacts to the visitor from noise pollution.

Burros that remain in areas after removal operations would continue to impact park resources.

Alternative B

The removal operations would cause short-term disturbances to native animals due to the use of helicopters, vehicles, and horses during actual operations. Birds and large mammals may vacate areas during the removal operations. Small mammals and reptiles would seek protective cover.

Traps and corrals would cause the local disturbance of vegetation and soils from trampling and wallowing of burros. Fence construction would cause vegetation and soil

disturbance. This impact would consist of fence posts being driven into the ground and trampling of plants and soils as construction crews erect the fence. Small mammals, birds, and reptiles would temporarily leave the area because of human disturbance.

In areas where vegetation would be damaged, or in bare areas, invader plant species, (both native and exotic) could become established as burros are removed.

It is likely that all burros would not be completely removed from areas targeted for zero burro use. Burros that remain in these areas would continue to impact park resources.

The removal of burros from areas of the park would eliminate the pleasure some people gain from viewing them.

The removal of burros from areas of the park would result in a reduction of free-roaming burro populations in the Southwest.

The closure of areas as safety precautions during the removal operations would inconvenience visitors who want to use these areas of the park.

Helicopter and vehicle use in the park during captures, and fence construction would generate minor dust and noise pollution. An insignificant amount of visual impact, noise, and emission of hydrocarbons into the air would result from the use of helicopters during the short term of capture operations. Fences constructed on park lands would cause an impact to the visual resources.

In spite of the mitigating measures and careful and professional handling of burros during removal operations, there may be burros injured or killed.

Alternative C

Unavoidable adverse impacts include continued and increased impacts from burro utilization to park resources. As burro populations continue to increase, and park resources deteriorate, mortality of burro populations would increase.

Alternative D

Unavoidable adverse impacts for this alternative would be the same as under alternative B.

Alternative E

Unavoidable adverse impacts under this alternative would be the same as under alternative B. Also, there would be visual impacts due to the direct reduction activities

relating to the sighting of burro carcasses and the possible observation of direct reduction activities.

Relationship Between Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Alternatives A and C

Long-term productivity would continue to be detrimentally impacted by burros. Adverse effects to soils, vegetation, and wildlife would continue and increase as long as burro populations continue to increase and expand in the park.

It is likely that under alternatives A and C there would be an irretrievable commitment of resources. As park resources, particularly soils and vegetation, continue to be impacted by burros, the gap between the resources' current condition and its ideal condition will broaden.

Alternatives B and D

Vegetation restoration in areas of burro use first requires the removal of burro populations. At this time, it would be infeasible to remove and maintain a zero population of burros in the recreation area. However, under alternatives B and D, burro numbers would be reduced to zero, in certain areas of the recreation area, while in other areas, burro numbers would be limited to allow for the recovery and restoration of native plants and animals.

Removal operations would involve short-term use of park lands for activities that are disruptive to park resources and visitors. These temporary disruptions are necessary to ensure achievement of long-term productivity and the restoration of natural processes associated with burro-free areas.

Burro viewing in the recreation area would be eliminated in certain areas. The elimination of this recreational opportunity would be offset by increased opportunities to view and experience a more natural desert ecosystem in the majority of park lands that presently contain unnatural conditions due to the activities of burros.

There would be no irretrievable commitment of key resources, including rare, threatened or endangered species, critical wildlife habitat, or cultural resources resulting from the execution of alternatives B and D.

Alternative E

The elimination of burros from the recreation area would ensure the achievement of long-term productivity and the restoration of the natural processes in Lake Mead NRA.

Removal operations would involve short-term use of park lands for activities that are disruptive to park resources and visitors.

Burro viewing in the recreation area would be eliminated. The elimination of this recreation opportunity would be offset by increased opportunity to view and experience a more natural desert ecosystem in park lands that presently contain unnatural conditions due to the activities of burros.

There would be no irretrievable commitment of key resources, including rare, threatened or endangered species, critical wildlife habitat, or cultural resources resulting from this alternatives. There would be an irreversible commitment of the lives of the burros that would be eliminated through direct reduction.

Future of Ecosystem Restoration within the park

Alternative A

Burro-caused degradation of native resources would continue and become more severe under this alternative. Burro populations would continue to increase in size and expand onto areas previously uninhabited by burros. New areas of the park would be impacted by burros. The success of resource programs at Lake Mead NRA would continue to be diminished by burro populations. Revegetation efforts, rare plants, tortoise populations and biodiversity goals are all currently impacted by burros and these impacts would increase.

Alternative B

Burro-caused degradation of native resources would decrease under this alternative. New areas of the park would not be impacted by burros. The success of resource programs at Lake Mead NRA would not be diminished by burro populations. Impacts to revegetation efforts, rare plants, tortoise populations and biodiversity goals would be reduced or eliminated.

Alternative C

Burro-caused degradation of native resources would continue and become more severe under this alternative. Burro populations would continue to increase in size and expand onto areas previously uninhabited by burros. New areas of the park would be impacted by burros. The success of resource programs at Lake Mead NRA would continue to be diminished by burro populations. Revegetation efforts, rare plants, tortoise populations and biodiversity goals are all currently impacted by burros and these impacts would increase.

Alternative D

Burro-caused degradation of native resources would decrease under this alternative. New areas of the park would not be impacted by burros. The success of most resource programs at Lake Mead NRA would not be diminished by burro populations. Impacts to revegetation efforts, rare plants, tortoise populations and biodiversity goals would be reduced or eliminated.

Alternative E

Burro-caused degradation of native resources would be eliminated under this alternative. New areas of the park would not be impacted by burros. The success of resource programs at Lake Mead NRA would not be diminished by burro populations. Impacts to revegetation efforts, rare plants, tortoise populations and biodiversity goals would be eliminated.

CONSULTATION AND COORDINATION

SCOPING

To help identify and summarize significant issues related to burro management, scoping was initiated. A notice of intent to prepare an environmental impact statement for burro management was published in the *Federal Register* on July 2, 1992. A news release announcing the intent to prepare a burro management plan was distributed on July 22, 1992.

Consultation with the USFWS was initiated October 14, 1992 pursuant to the Endangered Species Act of 1973, requesting a list of threatened and endangered species that may be present in the project area (Appendix J).

Public workshops were held and scoping mailers were distributed to allow the public to express their concerns and identify issues. A general news release announcing the scoping workshops was distributed prior to all the public meetings, then specific news releases were distributed to the locations where public meetings would be held. Also, informative letters were sent to organizations representing various interests. Workshop locations and attendance were as follows:

St. George, Utah	October 26	Attendance - 0
Carson City, Nevada	October 28	Attendance - 6
Kingman, Arizona	November 3	Attendance - 15
Henderson, Nevada	November 5	Attendance - 16
Phoenix, Arizona	November 9	Attendance - 24

More than 60 persons participated in the scoping workshops. More than 450 mailers were distributed to the public. More than 270 mailers were received with written comments. Written and oral comments were received between October 1 and December 15, 1992. Scoping served to identify the significant issues that were considered when developing this EIS. All ideas and suggestions the park received have been considered in the development of the range of alternatives for the EIS or have been addressed in the document. Once public comments were received and analyzed, a newsletter was sent in February 1993 with a summary of issues mentioned during scoping to more than 400 individuals and/or organizations who requested to be on the Lake Mead NRA mailing list relating to burro management.

The Kingman Resource Area BLM, Las Vegas District BLM, and Arizona Strip District BLM agreed to be cooperating agencies for the development of burro management at Lake Mead NRA in January 1993. Formal meetings were held with the cooperating agencies in April 1993 and March 1994, during which the preliminary tenets of the plan and draft alternatives were discussed.

AGENCIES/ORGANIZATIONS/INDIVIDUALS TO WHOM COPIES OF THE STATEMENT WERE SENT:

The NPS sent copies of the draft EIS and requested comments from the following agencies and interest groups:

Federal Agencies:
Advisory Council on Historic Preservation
Department of Agriculture
    Forest Service
    Soil Conservation Service
Department of Defense
    Department of the Army, Corps of Engineers
Department of the Interior
    Bureau of Indian Affairs
    Bureau of Land Management
    Bureau of Mines
    Bureau of Reclamation
    Fish and Wildlife Service
    Geological Survey
Department of Transportation
    Federal Highway Administration
Environmental Protection Agency

Arizona State Agencies:
Governor of Arizona
Arizona Department of Agriculture
Arizona Department of Transportation
Arizona Game and Fish Department
Arizona Office of Tourism
Arizona Outdoor Recreation Coordinating Commission
Arizona State Clearinghouse
Arizona State Historic Preservation Office
Governor's Commission on Arizona Environment

Nevada State Agencies:
Governor of Nevada
Nevada Department of Agriculture
Nevada Department of Natural Resources
Nevada Department of Transportation
Nevada Division of State Parks
Nevada Natural Heritage Program
Nevada State Clearinghouse
Nevada State Planning Coordinator

Nevada State Historic Preservation Office
University of Nevada

Local Agencies:
Bunkerville Town Board
City of Boulder city
City of Henderson
City of Kingman
City of Las Vegas
City of Mesquite
City of North Las Vegas
City of Phoenix
Clark County Commissioners
Clark County Manager
Clark County Wildlife Advisory Board
Las Vegas Valley Water District
Mohave County Board of Supervisors
Pahrump Valley Paiute
Searchlight Town Advisory Board

Other Organizations:
Animal Protection Institute
Arizona Riparian Council
Arizona Wilderness Coalition
Arizona Wildlife Federation
Arizonans for Wildlife and Outdoor Recreation
Colorado River Fish and Wildlife Council
Commission for the Preservation of Wild Horses
Defenders of Wildlife
Desert Bighorn Council
Desert Bighorn Sheep Society
Desert Research Institute
Desert Tortoise Council
Environmental Defense Fund
Fund for Animals
International Society for the Protection of Mustangs and Burros
Maricopa Audubon Society
Mohave Native Plant Society
National Parks and Conservation Society
National Mustang Association
National Wild Horse Association
Nevada Bighorn Unlimited
Nevada Horsemen's News
Nevada Humane Society

Nevada Wildlife Federation
Northern Arizona Audubon Society
Red Rock Audubon Society
Rocky Mountain Bighorn Society
Sierra Club
Southern Utah Wilderness Alliance
Southern Nevada Off-Road Enthusiasts
Society for Range Management
The Desert Protection Council
The Nature Conservancy
The Tortoise Group
Utah Wilderness Association
Wild Ass Foundation of America, Inc.
Wild Burro Rescue
Wilderness Research Impact Foundation
Wild Horse and Burro Commission
Wild Horse Organized Assistance
Wildlife Society
World Wildlife Fund

Libraries:
Boulder City Library
Clark County Community College
Clark County Library
Las Vegas Public Library
Mohave County Library
Sunrise Public Library
University of Arizona Library
University of Nevada-Las Vegas Library

Concessionaires:
Black Canyon, Inc.
Callville Bay Resort
Cottonwood Cove Resort
Echo Bay Resort
Forever Resorts
Forrest Enterprises, Inc.
Lake Mead Ferry Service
Lake Mead Resort
Lake Mohave Resort
Lakeshore Trailer Village
Las Vegas Boat Harbor
Overton Beach Resort
Temple Bar Resort

Willow Beach Resort

Elected Representatives:
Senator Richard Bryan (NV)
Senator Harry Reid (NV)
Representative James Bilbray (NV)
Representative Barbara Vucanovich (NV)
Senator Dennis DeConcini (AZ)
Senator John McCain (AZ)
Representative Jim Kolbe (AZ)
Representative John Kyl (AZ)
Representative Coppersmith (AZ)
Representative Bob Stump (AZ)
Representative Karen English (AZ)
Representative Ed Pastor (AZ)

A mailing list was compiled from the scoping portion of the planning process. Individuals from this list were notified of the availability of the EIS and could request the plan in writing.

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APPENDIXES

APPENDIX A
CURRENT COOPERATIVE EFFORTS BETWEEN NPS AND BLM

OPERATIONAL AGREEMENT AND IMPLEMENTATION STRATEGY

FOR WILD HORSE AND BURRO MANAGEMENT

ON BLM AND NPS ADMINISTERED LANDS

IN THE VICINITY OF DEATH VALLEY NATIONAL MONUMENT, CALIFORNIA

1.0 Purpose and Need for an Operational Plan

The Bureau of Land Management in the California Desert (BLM, CDCA) and the National Park Service in Death Valley National Monument (NPS, DEVA) have successfully managed wild horses and burros on their areas of responsibility on a cooperative basis over the last approximately 10 years. Different agency mandates, however, have led to operational problems along the boundary and uncertainty regarding methods used to achieve management goals. A review of the existing problems has led to the identification of solutions to problems that have, from time to time, compromised each agency in its ability to achieve management goals. Program review has also resulted in the development of an operational procedure that will allow established, on-going programs to continue as efficiently and effectively as possible. Problems identified in reaching the goals established by each agency have developed due to a variety of factors:

* Insufficient funding to enable BLM to timely and efficiently remove horses and burros in the Panamint Herd Management Area, including Hunter Mountain.

* Drift of burros primarily from BLM administered lands to National Monument lands.

* Different methods of removal allowed for under existing policies and regulations.

2.0 Management Policies of the Bureau of Land Management and the National Park Service Regarding Horses and Burros.

2.1 Bureau of Land Management

The Wild Horse and Burro Act of 1971 provides the legal basis for management of wild horses and burros by BLM. The law states that "...the Secretary of the Interior shall manage wild free-roaming horses and burros in a manner that is designed to achieve and maintain a thriving natural ecological balance on public lands." The Act also provides for the inventory, study, and removal (if necessary) of wild horses and burros. These animals should be managed because, in the words of Congress, "...wild free-roaming horses and burros are living symbols of the historic and pioneer spirit of the west..." It is Bureau policy to preserve, protect, and humanely manage these wild horses and burros.

2.2 National Park Service

National Park Service (NPS) management policies are derived from statutes such as the NPS Organic Act of 1916 as amended, and in the Act of March 27, 1978, and various regulations and are set forth by the NPS in a publication entitled Management Policies. This document was last revised in 1988, at which time the public was invited, through announcements in the Federal Register, to comment on the proposed revisions.

The management policies are clear concerning exotic species in NPS units:

* Exotic species are those which occur in a given place as a result of direct or indirect, deliberate or accidental actions by humans...the exotic species introduced because of such human action would not have evolved with the species native to the place in question and, therefore, would not be a natural component of the ecological system characteristic of that place (National Park Service Management Policies, 1988, Ch. 4:11).

* Management of populations of exotic plant and animal species, up to and including eradication, will be undertaken wherever such species threaten park resources or public health and when control is prudent and feasible. Examples of threatening situations include ... interfering with natural processes and the perpetuation of natural features or unique species.

* The decision to initiate a management program will be based on existing, and where necessary, newly acquired, scientific information that identifies the exotic status of the species, demonstrates its impact on park resources, and indicates alternative management methods and their probabilities of success. A management plan will be developed and implemented according to established planning procedures and will include provisions for public review and comment, where appropriate (National Park Service Management Policies, 1988, Ch. 4:12).

Thus, the National Park Service must attempt to eradicate populations of alien species if the following conditions are met:

A) The species in question occurs in a National Park Service unit only because of direct or indirect, accidental or deliberate human actions, and did not evolve with the native species present;

B) The alien species threatens park resources or public health;

C) Control is prudent and feasible; and

D) A management plan with alternatives is developed, with appropriate public review.

3.0 Brief Account of the Current Programs for Managing Horses and Burros on BLM and NPS Administered Lands in the Vicinity of Death Valley National Monument.

3.1 BLM Program in the CDCA

The California Desert Conservation Area Plan of 1980 (CDCA Plan) was prepared to establish guidance for BLM to manage the public lands of the California Desert. The Wild Horse and Burro Element of the CDCA Plan includes goals "...designed to reduce conflict where other high resource values occur and to intensively manage wild horses and burros in areas where low or moderate conflict with other resources occur." The CDCA Plan designated 22 Herd Management Areas (HMAs) to preserve the home ranges of a majority of wild horses and burros in the California Desert. Populations of wild horses and burros were to be protected and managed in 17 HMAs (retention HMAs) and eliminated from the five other HMAs (removal HMAs) where conflicts existed with natural, wildlife, and cultural resources.

Three of the HMAs, Waucoba/Hunter Mountain, Panamint, and Sand Spring/Last Chance, border DVNM. The CDCA Plan established prescribed population levels of wild horses and burros in each of the retention HMAs by balancing the needs of these animals with potential conflicts with other resources and management actions. Waucoba/Hunter Mountain was designated as a retention HMA. The HMA is comprised of three concentration areas, with a prescribed population level of 0 horses and 357 burros (as per the Saline Valley and Lee Flat HMA Plan). The animals were to be retained in two of the three concentration areas, and no animals were to be retained in the third concentration area, Hunter Mountain. The Panamint HMA also included several concentration areas. The concentration areas in the Panamint Mountains were designated for removal of all wild horses and burros. The concentration areas in Panamint Valley were designated for retention with a prescribed population level of 0 horses and 240 burros. Sand Spring/Last Chance was designated as a removal HMA.

A 1983 amendment to the CDCA Plan redesignated the Panamint Valley concentration areas for removal of animals. At that point, the entire Panamint HMA was designated for removal (i.e., there would be no burros or horses in the HMA). The Record of Decision for the Amendment stated that following approval of the CDCA Plan in 1980, DVNM completed a management plan "...calling for removal of burros from land bordering the Panamint HMA...", and that burro migratory patterns overlap BLM and DVNM, "...making it unfeasible to maintain

a population in BLM land when removal will be practiced in adjacent jurisdiction."

To reach the prescribed population levels for the three HMAs, BLM wranglers have conducted several tours since 1980 to gather wild horses and burros and place them in BLM's adoption/sanctuary programs. The numbers of animals gathered in the HMAs are shown in the following table.

WILD HORSE AND BURRO REMOVALS
ADJACENT TO DEATH VALLEY NATIONAL MONUMENT

HMA	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL	
Waucoba/ Hunter	0	275	200	350	613	326	0	0	0	37	267	0	0	0	0	2068	Burros
	0	0	6	0	0	0	0	0	0	0	0	0	0	15	0	21	Horses
Pana- mint	0	0	•	•	793	0	603	131	35	379	0	65	46	0	0	2052	Burros
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Horses
Sand Spring	0	0	•	•	0	0	0	0	0	0	0	0	0	0	0	•	Burros
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Horses

Note: • Separate totals were not counted for these HMAs in these years. The numbers of animals captured were included in the totals shown for the Waucoba/Hunter Mountain HMA.

3.2 NPS Program in DVNM

Because burros, an exotic species, were causing substantial damage to plant, animal and water resources in the Monument, and could be controlled or eliminated from the Monument through a capture and adoption program, the National Park Service chose to implement an approved horse and burro elimination plan in Death Valley beginning in 1983.

Research documenting the environmental damage formed the basis for the management actions prescribed in the Proposed Natural and Cultural Resources Management Plan and Environmental Impact Statement for Death Valley National Monument, published by the National Park Service in 1982. The document considered alternative methods of burro removal and environmental restoration. Significant public comment from animal protection groups prompted the National Park Service to propose the program that was implemented: an intense three-year live-capture program followed by direct reduction of stragglers.

Between 1983 and 1986, the National Park Service live-captured and removed 5787 burros, 87 horses and five mules from Death Valley National Monument. The capture and removal was carried out by BLM staff hired by the National Park Service at a cost of $1.7 million. All of those captured were placed through transfer to animal protection groups such as the Fund for Animals, sold to individuals through the NPS adoption program, or auctioned off to those wanting larger numbers of animals. Individuals and groups receiving burros were required to sign a statement they would care for the animals in a humane manner as a pet, etc. Over 2500 animals were provided to animal protection groups.

After the NPS capture program the Fund for Animals was given permission to live-capture any remaining burros or horses until June 30, 1987. They operated two roundups, one in October 1986 and the other in March 1987. An additional 230 burros were removed by their efforts, primarily from the northern portions of the Monument.

At the end of the live-capture phase, straggler and immigrant burros remained in isolated canyons of the Monument, and were removed opportunistically by direct reduction (shooting). NPS personnel have shot approximately 260 burros since direct reduction began in 1987. Some burros remain in isolated canyons, due at least in part to burros entering the Monument from adjacent BLM lands. The last live capture conducted by BLM in the Panamint Range occurred in 1988 when 65 burros were removed, mainly from the Hall, Jail and Tuber Canyons. In January 1990 the BLM and NPS conducted a joint removal effort of horses on Hunter Mountain. Fifteen horses were live captured by BLM wranglers inside the Monument using a helicopter paid for by DVNM.

In summary, the Death Valley burro program was developed over a long-term period, and overall public comment supported the plan that was implemented. The program has been successful; environmental damage due to burros has been halted, and some areas are experiencing recovery. Desert bighorn sheep have greater access to forage and water. A relatively small number of burros continue to be taken each year because the vast majority were removed via the live-capture program.

4.0 Problems Associated with Current Burro and Horse Removal Programs

The problem area in managing wild horses and burros is BLM's Panamint Herd Management Area south of Towne Pass and the adjoining lands in DVNM. Currently an estimated 70-90 burros reside in this portion of the Panamints, even though management plans and decisions of both agencies called for the elimination of burros in this area years ago.

Removal of horses and burros under existing management decisions of both the BLM and NPS is difficult due to a variety of reasons. The difficulties are most evident in conducting a live-capture. The primary problems of the program are:

* High cost of conducting a monitoring and removal program due to remote, rugged, primarily roadless terrain necessitating the use of aircraft and gathering crews on horseback.

* Drift of animals across the administrative boundary, believed to be primarily from BLM to NPS lands. There is no continuous topographic feature along the boundary to

prevent burros from migrating back and forth between BLM and DVNM. This creates a management conflict. In addition, the burros are creating resource conflicts by trampling springs, which wildlife such as bighorn sheep depend on in this arid mountain range.

* Inadequate funding to enable BLM to achieve management goals of zero population in timely manner. BLM successfully removed over 2,100 burros from the Panamints from 1979 to 1989. The last BLM roundup of burros in the Panamints south of Towne Pass was in 1988. The current estimated population of 70-90 burros is believed to increase by 20% per year from reproduction. If regular roundups are funded in the future, the number of burros could be brought down to low levels, probably 20-25 head scattered throughout the range. The remaining few burros would be difficult to locate and gather, and the cost per head to gather them could approach $1,500.

* Potential for mistaking areas of particular agency responsibility due to an unmarked boundary.

5.0 Management of Existing Programs for Burro and Horse Elimination

5.1 Management Actions to be Implemented

Several actions have been identified that will enhance the current management program. The management goals for both agencies remain in effect: the complete removal of burros and horses within the Panamint Herd Management Area and within Death Valley National Monument. The following operational procedures and actions are to be implemented:

A) **One-Mile Shooting Buffer** - Establish a one-mile no shooting buffer within DVNM in areas of known, frequent drift, i.e., from Towne Pass south to the BLM Ridgecrest Resource Area boundary. However, due to the existence of nine springs in that may continue to support burros within the one-mile zone inside the Monument, the one mile no shooting buffer will be reduced to the point where direct reduction can be accomplished in the vicinity of six of the nine springs, as follows: Jail Canyon Spring, Hatchet Spring, Quail Spring, Greater View Spring, Russell Spring, Jubilee Spring. Three unnamed springs northeast of Needle Peak will remain within the no-shooting buffer zone. The reason for this modification is to preclude the possibility of mistaking the administrative boundary in a roadless area that would typically be accessed by helicopter.

Access to the six springs listed above for conducting direct reduction will be by conventional vehicle in combination with foot travel. Helicopter transport of personnel will not be

used for direct reduction exercises in the above named areas.

B) **Procedural Changes for Direct Reduction in DVNM** - Modify the procedures used in the direct reduction program in DVNM. Procedural changes will include:

1) Only trained marksmen certified by the Chief Ranger will conduct direct reduction.

2) On opportunistic encounters of one or two burros in the field within DVNM, verify location using topographic maps and confirm location with the Chief Ranger's Office.

3) On a scheduled direct reduction program, a detailed briefing session will be held with appropriate staff under the Chief Ranger and the Chief of Resources Management. Briefing will document search locations on topographic maps, dates and times scheduled for conducting direct reduction. Detailed accounts of activities will be prepared by the designated Rangers after each day's activities.

4) Until further notice, a maximum of two burros will be shot and killed at any one location and will be a minimum of 200 yards from any roads and springs and will only be shot from the ground. Any third animal in the same group that is shot and killed will be at least 0.25 mile farther away from the first two. The above policy will be reviewed by the Superintendent in 1992 to determine if the limits on numbers of burros shot at any one location is reducing the effectiveness of the program. If this review reveals the current practice should changed to allow for greater numbers to be taken in any one place then the Superintendent may modify the current policy accordingly.

5) If significant numbers of burros are consistently observed in a localized area and where it may be possible to capture alive for adoption, animal protection groups may be given a 30 day opportunity to remove the animals if they desire using their own funding and personnel.

C) **Monitoring and Capture Program** - BLM will implement a program beginning in FY93 to detect and live capture burros on public lands within the Panamint HMA, and within the one mile buffer in DVNM if they choose. The capture operation would be scheduled every two years until populations were determined to be brought to zero or too small to be cost effective to gather. This goal is expected to be achieved by the year 1999 after four monitoring and capture tours.

For each year a capture operation is conducted, the cost in

1992 dollars would be $28,875. This would fund a standard 10 day tour of BLM's wrangler crew to include $6,000 in salaries for the four men, $1,500 for vehicles, $3,000 for per diem, $500 for miscellaneous, and $16,875 for helicopter time (45 hours at $375 per hour). In addition, there would be a cost of $115 per burro to process the animals through BLM's adoption program.

BLM and NPS will meet in off years (between tours) to evaluate progress of the program. At this time the program is not funded. The District Manager (CDCA) and the Superintendent (DVNM) will meet bi-annually beginning in FY92 to identify specific costs of the program and how the operations will be funded.

5.2 Management Action Considered but Rejected

An additional action considered but rejected was to fence the boundary of DVNM and the CDCA south of Towne's Pass to prevent or restrict burro movement. To accomplish this, much of the boundary would need to be fenced because burros are capable of negotiating rough terrain. Approximately 34 miles of fence would be required, and costs are estimated at $1,090,000 ($32,000/mile) with an annual maintenance cost of $25,000. This figure includes administrative costs such as survey, environmental compliance, and contract administration as well as installation and materials cost.

This action is rejected for several reasons. First, the action is inappropriate because management decisions of both agencies call for the total removal of burros and horses in the Panamint HMA and DVNM. Second, the installation cost is extremely high and beyond the budgetary capability of either agency. Third, such a fence is considered incompatible with other resource management goals and directives, specifically those pertaining to wildlife and wilderness management.

6.0 Alternative Actions Selected/Management Decision

The Superintendent of DVNM and the District Manager of BLM have reviewed the range of alternative actions described above and have decided to implement Actions A, B and C.

7.0 Management Review and Approval

7.1 Review

This agreement will be reviewed annually by the BLM District Manager and Superintendent of DVNM, and modified as necessary to insure management programs for horses and burros undertaken by each agency on lands under their jurisdiction continue to be consistent with national policies.

7.2 Approval

Bureau of Land Management:

Gerald E. Hillier, District Manager
California Desert District

4/22/92
Date

National Park Service:

Edwin L. Rothfuss, Superintendent
Death Valley National Monument

4/22/92
Date

APPENDIX B: APPLICABLE STANDARD OPERATING PROCEDURES FOR CONTROL METHODS

These are standard operating procedures for alternatives A, B, D, and E.
Captures would take place year round at Lake Mead NRA. Burro foaling season occurs year round at Lake Mead NRA based on monitoring and capture data. No time of the year for capture activities is indicated by the available information to eliminate the possibility of capturing young foals.

Captures would occur in areas where the greatest number of burros are located at the time. It is not feasible to specify where trap locations would be until pre-capture surveys have been conducted. Lake Mead NRA personnel would locate the burros and then establish a trap location as close as possible to the burros. Typically, capture sites are accessible by road and are located in washes or along existing trails adjacent to roads. If capture sites are not accessible by road, trap sites would be located in washes along the shore of Lake Mohave and Lake Mead in areas accessible by boat.

Wing traps are constructed from portable pipe panels with wings of burlap hung on fence posts leading away from the corrals. After completion of a trapping event, all materials are removed. In roping and net-gunning efforts, temporary corrals constructed of portable pipe panels are installed.

Trap sites or holding corrals would not be placed in areas occupied by any known listed or proposed threatened or endangered plant or animal species or in any area having known historical or prehistoric significance.

All trap and corral sites would be surveyed for threatened and endangered species by qualified NPS personnel prior to trap construction. In areas where there are known threatened and endangered species, NPS resource management specialists would determine where to construct temporary traps and corrals in order to avoid impact to these species.

The evaluation of cultural resources would be done in compliance to Section 106 of the National Historic Preservation Act prior to construction of temporary corrals and traps. Traps and corrals would not be located in areas of known cultural resources. If any evidence of cultural resources is found during the operation, a NPS cultural resource specialist would immediately be called in for evaluation.

Helicopters would be used with caution. A qualified NPS representative would be present during capture attempts to ensure strict compliance with Federal Aviation Administration regulations and DOI policies to ensure a safe, economical, humane, and efficient method of performing the operations. All aircraft and pilots would be Office of Aircraft Service (OAS) certified and would comply with OAS Departmental Manual and Operational Procedural Memorandum.

When herding burros with a helicopter, only experienced, certified (Contractor's Federal Aviation Certificates) pilots would be utilized with a helicopter capable of flying the mission. The burros would be herded and handled in a careful and efficient manner. Hazards such as cliffs, fences, and mine shafts would be scouted in advance and avoided. Existing trails, roads and washes would be used whenever possible. burros would be allowed to choose their own route to a capture site and would not be pushed to the extent that jennys would abandon their foals or animals would injure themselves.

Burros would not be run more than 4 miles nor faster than 15 miles per hour (mph) by a helicopter while herding them toward a capture site. Most burros would travel at a canter or trot and would be allowed to do so. Burros would not be allowed to stop for a long period of time, as they may attempt to leave the trap area. Herding would begin at first daylight, and if temperatures climb to above 110 degrees, herding would be stopped. During the summer, capture operations would cease by 1 p.m. before the maximum heat of the day occurs.

NPS staff would make careful determination of the boundary line to serve as an outer limit within which attempts would be made to herd burros to a given trap. Topography, distance, weather and current physical conditions of the burros would be considered in setting the mileage limits to avoid undue stress on the burros while they are being herded. NPS personnel present at the capture site would ensure minimum injury or other traumatic effects to the burros.

Every effort would be made to keep jennies and their foals together. If trailer space is limited the foals would be hauled separately and then reunited with their mothers upon arrival at the holding facility to prevent them from being kicked or stepped on by other burros. No problem of reuniting mothers with foals has been experienced in past operations. If needed, a jenny and foal may have to be isolated from other burros until they bond.

Handling of burros would be kept to a minimum. Capture and transportation can be stressful to the animals. Minimizing the handling would increase the safety of the burros, as well as the handlers.

Captured burros would be marked with identification numbers to assure that if burro fatalities occur after removal operations, the methods can be evaluated, and appropriate measures can be deployed to improve the operations.

Captured burros that are obviously lame or sick and cannot be transported to the holding facility without causing undue pain or suffering to the animals would be disposed of at the capture site. All other animals including old, lame, and deformed burros would be transported to the holding facility where a veterinarian would make the final decision as

to the extent of an animal's suffering and prognosis for recovery before making the determination if an animal's life needs to be terminated. If animals are to be dispatched, it would be done as humanely as possible.

The appropriate State Brand Inspector Office would be contacted in the event that burros had to be moved across state lines.

Temporary traps and corrals would be removed, and sites would be left clean of all debris following the completion of the capture and removal operation.

APPENDIX C: BURRO UTILIZATION STUDIES VEGETATION MONITORING PROCEDURES LAKE MEAD NATIONAL RECREATION AREA

Utilization

To estimate the impact on plants from forage consumption by burros, an annual assessment of utilization on permanent transects would be conducted. Several utilization monitoring methods are currently being employed on permanent transects at Lake Mead NRA. These methods and transects would continue to be used until their usefulness has been adequately evaluated. Description of methods are as follows:

1. Binomial Utilization Method (BUM) - Developed by researchers from the University of Arizona specifically to address the measurement of utilization on shrubby plants at Lake Mead. This method classifies utilization into two groups (above or below 50 percent use) based on percent of stem tips removed by grazing animals.

2. Key Forage Plant Method (BLM) - Used by Bureau of Land Management, this method employs ocular estimates (percent by weight) of herbage removed from plants. The method classifies plants into five or six classes, based on percent utilization.

3. Lake Mead Utilization Method (LMNRA) - This method classifies utilization of shrubs and perennial forbs into three groups based on percent of stems removed. Utilization of grasses is based on percent of weight removed, estimated in three classes.

Plant Frequency and Trend

Plant frequency sampling is a common method of monitoring vegetation changes on rangelands. Plant frequency is the percentage of plots (quadrats) in which a plant species occurs when a series of quadrats are located repeatedly in a certain area. Frequency is sensitive to changes in plant density and dispersion (and quadrat size). By measuring the same areas over several years, changes in plant frequency can be determined and management changes can be considered. The apparent trend (movement in succession of change compared with vegetation management goal) can be judged by changes in frequency over time.

Approximately 60 permanent transects would be established to monitor changes in frequency over time. These transects would be read every one to three years, depending on staff time and perceived rate of change on various sites.

Density

Density is the number of individuals of a plant species present in a unit area. Several density plots were established by the University of Arizona in 1990. These plots were established inside and outside burro exclosures for comparative purposes. The plots would be remeasured every two to four years to determine changes in density over time.

BURRO UTILIZATION STUDIES
LAKE MEAD NATIONAL RECREATION AREA

Black Mountains, Arizona, Lake Mead National Recreation Area
Percent Utilization of White Bursage (*Ambrosia dumosa*)*

Transect	Method	1990	1991	1992
Kingman Wash #1	LMNRA	--	--	78
Palo Verde #1	LMNRA	--	--	42
Palo Verde #2	LMNRA	--	--	23
Palo Verde #3	LMNRA	--	--	17
Powerline	BLM	79	78	79
Eldorado	BLM	68	51	72
Sheeptrail	BLM	79	79	79
Owl Point	BLM	73	70	46
Black Mts.#1	LMNRA	--	--	61
Black Mts.#2	LMNRA	--	--	28
Black Mts.#3	LMNRA	--	--	18
Black Mts.#4	LMNRA	--	--	51
Black Mts.#5	LMNRA	--	--	58

Gold Butte Utilization Summary
Average Percent Utilization*

Transect	Plant	1990	1992	Method
Quail Springs	Bursage	49	38	BUM
Twin Springs	Bursage	63	36	BUM
Walker Wash	Catclaw	44	35	BUM
Jawbone	Cheesebush	38	27	BUM
Wild Burro Wash	Catclaw	27	55	BUM
Burro Bay	Bursage	75	75	BUM
Burro Bay	Mormon tea	40	49	BUM
Gregg's Wash	Bursage	75	75	BUM
Catclaw Wash	Bursage	--	21	LMNRA
Delmar Butte	Bursage	--	78	LMNRA
Hell's Kitchen	Bursage	--	76	LMNRA

Lake Mead National Recreation Area
Eldorado Mountain Utilization Summary

Transect	Plant	Method	Percent Utilization (1992)
Eldorado #1	Bursage	LMNRA	16.5
Eldorado #2	Bursage	LMNRA	16.5
Eldorado #3	Bursage	LMNRA	38.0
Burro Wash #1	Catclaw	LMNRA	47.0
Burro Wash #2	Catclaw	LMNRA	59.0
Burro Wash #3	Catclaw	LMNRA	55.0

Kingman Wash Utilization Summary

Transect	Plant	Method	Percent Utilization (1992)
Kingman Wash #1	Bursage	LMNRA	78.0

Muddy Mountains Utilization Summary

Transect	Plant	Method	Percent Utilization (1992)
Muddy Mts.#1	Sacaton	LMNRA	83.5
Muddy Mts.#2	Sacaton	LMNRA	83.0
Muddy Mts.#3	Saltgrass	LMNRA	33.0
Muddy Mts.#4	Saltgrass	LMNRA	28.0
Muddy Mts.#5	Bursage	LMNRA	63.0
Muddy Mts.#6	Bursage	LMNRA	44.0

Arizona Gypsum Beds Utilization Summary

Transect	Plant	Method	Percent Utilization (1992)
Gypsum Beds #1	Bursage	LMNRA	40.0
Gypsum Beds #2	Bursage	LMNRA	22.0
Gypsum Beds #3	Bursage	LMNRA	18.0

APPENDIX D: 1991 BURRO INVENTORY RESULTS BLACK MOUNTAIN BIOLOGICAL UNIT, ARIZONA

Purpose

A tri-agency inventory of the burro population of the Black Mountain Biological Unit was undertaken from May 29 through June 25, 1991. Representatives of Arizona Game and Fish, Bureau of Land Management, and National Park Service participated in the survey. The purpose of the inventory was to collect data for population estimates and population age, color, and sex structure.

The Inventory Area

The Black Mountains are located 12 miles east of Kingman and extend from south of Yucca, 100 miles north to Hoover Dam. The major physical features in the area inventoried include the Black Mountains, Wilson Ridge, the Colorado River Valley, and Sacramento/Detrital Valley. The vegetation is typical of the lower Sonoran desert and Mojave Desert shrub with influence from the Arizona Interior Chaparral on the higher slopes of the Black Mountains.

Permanent water is available for burros along the Colorado River north of Katherine Landing and from numerous springs and seeps throughout the Black Mountains.

Materials and Methods

One hundred eight and one half (108½) hours of helicopter time were used for the burro inventory. The helicopter used was a Hughes 500D with the doors removed. The marking agent was plastic, marble-sized projectiles fired from a Carbon Dioxide powered rifle. The plastic paint balls explode on impact, leaving a two to four inch orange spot on the marked animals. Because of the shooter's position in the helicopter, most animals were marked on the right hip or side.

The inventory was done in two phases. The first phase was to locate and mark as many burros as possible. When flying in relatively open country, a grid pattern was flown to locate the animals; in mountainous areas and steep canyons, a contour pattern was flown. If a mother and foal were observed, only the jenny was marked to keep stress experienced by the foal to a minimum. During the recount, unmarked foals with marked jennies were counted as marked. During the marking phase, data was recorded on total number of animals marked, age class, and location.

During the second phase, the entire area was flown again and data was recorded, which included total number of burros observed, number marked and unmarked, age class, sex, color, and location. All locations were plotted directly onto topographic maps during the flights.

The Black Mountain Biological Unit can be conveniently separated into five flight areas delineated by roads. The boundaries of those five areas area:

Area I.	Interstate 40 to Route 66
Area II.	Route 66 to Highway 68
Area III.	Highway 68 to Cottonwood Road
Area IV.	Cottonwood Road to Highway 93 (Hoover Dam)
Area V.	Highway 93 to Temple Bar

Once work had begun in a given flight area, both phases (mark and recount) were completed before moving on to the next area. This was done to insure that marks would not be lost between the marking and recounting phase of the study. Using this system, time between the marking and resighting varied from 2-5 days.

The Lincoln-Peterson formula was used to estimate the burro population size:

$$N = Mn/m$$

N = Estimate of Population
M = Total number of burros marked (phase one)
n = Total number of burros counted (phase two)
m = Total number of marked burros resighted (phase two)

Confidence limits were assigned to the population estimates through the formula: 95 percent confidence limits = N ± 2 Standard Errors. The Standard Error was calculated using the formula:

$$S.E. = \frac{M^2 n\,(n-m)}{m^3}$$

Sighting rate (S.R.) was determined by the formula:

$$S.R. = \frac{m}{n}\,(100)$$

Results

Data collected during these surveys is summarized in Tables 1 - 7.

Table 1. Summary of Burro Survey Results

Flight Area	#Marked (M)	Recount marked (m)	Recount Un-Marked	Total (n)	Pop. Estimate	Sighting Rate (S.R.)
1	161	103	131	234	378 ± 54	64%
2	135	67	87	154	310 ± 57	50%
3	204	141	63	204	295 ± 28	69%
4	155	87	60	147	262 ± 36	56%
5	62	37	31	68	114 ± 25*	60%
TOTAL	**717**	**435**	**372**	**807**	****1342 ± 87**	**61%**

*6 horses were observed in Temple Bar Area

**Total population estimate includes 12 burros not marked at the town of Oatman.

Table 2. Black Mountain Burro Population
Age Structure (Spring, 1991)

Flight Area	Adults	%	Yearling	%	Colts	%
1	156	71	26	12	38	17
2	123	80	5	3	26	17
3	145	71	21	10	39	19
4	102	70	8	5	35	25
5	45	66	7	10	16	24
TOTAL	**571**	**72**	**67**	**8**	**154**	**20**

Table 3. Black Mountain Burro Sex Ratios
(Spring, 1991)

Flight Area	Male	%	Female	%
1	88	48.6	93	51.4
2	62	49.2	64	50.8
3	89	50.6	87	49.4
4	40	38.8	63	61.2
5	19	37.3	32	62.7
TOTAL	**298**	**46.7**	**339**	**53.2**

Table 4. Black Mountain Burro Population
Color Ratio (Spring, 1991)

Flight Area	Gray	Brown	Black	Red	Pink	Blue	White	Paint	Other
1	168	52	1	3	3	3	1	2	-
2	97	39	-	1	1	-	11	6	-
3	113	68	5	-	10	1	-	3	4
4	78	59	2	-	3	5	-	-	-
5	50	14	4	-	-	-	-	-	-
TOTAL	**506**	**232**	**12**	**4**	**17**	**9**	**12**	**11**	**4**
PERCENT	62.9	28.8	1.4	.5	2	1.1	1.5	1.4	.5

Table 5. Ohmart/Walker Study Area

Year	Marked	Counted	Recount	Sighting Rate	Lincoln Index
1977	225	not given	114	51%	456
1981	190	262	110	57%	452
1986	97	105	69	71%	135
1991	62	75	27	36%	172

Table 6. Black Mountain Lambing Ground Areas
(Spring, 1991)

Flight Area (Lambing Grd)	Number Marked	Recount Marked	Recount Unmarked	Total	Lincoln Index
1 (Columbine)	-	3	-	3	-
2 (Mt.Nutt)	26	10	4	14	36
3 (Cane Mt.)	29	5	7	12	70
4 (Mt. Davis)	18	7	5	12	31
5 (Fort.Hill)	10	6	-	6	10
TOTAL	**83**	**31**	**16**	**47**	**150**

Table 7. National Park Service Areas
(Spring, 1991)

Flight Area	Number Marked	Recount Marked	Recount Total	Population Estimate	Sighting Rate
3	119	92	121	157 ± 16	77%
4	105	54	86	167 ± 28	51%
5	62	37	68	114 ± 25	60%
TOTAL	**286**	**183**	**275**	**438 (430 ± 30)***	-

Summary

A total estimate of 1,342 ± 87 burros was calculated for the entire study area. From mapping locations of animals sighted during both phases of the study, distribution was obviously concentrated around water sources. Most animals were found within 3 miles of either a known spring or seep, or they were within 3 miles of the shoreline of Lake Mead or Lake Mohave.

Personnel from all three agencies involved in the study felt that the methodology used provided a reasonably accurate estimate for the area surveyed. Concerns that marks could be lost between the marking and resight phases of the study were alleviated by the ease with which most marks could be identified. Furthermore, it is believed that adequate time was provided for marked and unmarked animals to mix following the marking phase of the study. This belief is based upon the observation of numerous mixed groups of marked and unmarked animals during the resight phase of the study. It is further supported by the interspersed nature of sightings of marked and unmarked animals observed during the study when plotted on maps.

Sex ratios in flight areas 1 through 3 were almost 1/1. Sex ratios of 38.8 males/61.2 females and 37.3 males/62.7 females were observed in flight areas 4 and 5 respectively. Overall, the sex ratio was 298 males to 335 females. None of the observed differences in sex ratios was significantly different from 1/1.

Observed reproductive rates varied from a low of 17 percent in flight areas 1 and 2 to a high of 25 percent in area 4. Overall, the reproductive rate averaged 20 percent.

The inventory indicates that the Black Mountain Biological Unit supports a highly productive burro herd with a reproduction rate which approaches, and possibly exceeds, 20 percent per year. Past management efforts have reduced the herd size from an estimated 1,933 animals in 1982 to the 1991 estimate of 1,342.

Report prepared by:

Kent Benson, Bureau of Land Management
Ross Haley, National Park Service
Carl Lutch, Arizona Game and Fish Department

APPENDIX E: SPRINGS IN LAKE MEAD NRA

NEVADA

Newberry Mountain area:
Sacatone Spring
Hiko Spring
Pipe Spring
Dripping Spring
Discovery Spring
Upper Sacatone springs
Willow Spring
Bridge Canyon Spring
Upper Bridge Canyon springs
Upper Grapevine springs
Lower Bridge Canyon Spring
unnamed springs (2)

Colorado River hot springs:
Seeping Spring
Arizona Hot Springs.
Boy Scout Spring
White Rock Spring
Gold Strike Spring

Out-lying areas:
Aztec Spring
unnamed spring

Callville\Echo\Overton Beach area springs:
Cottonwood Spring
Sandstone Spring
unnamed spring
Bluepoint Spring
Rogers Spring
Scirpus Spring
Corral spring
Mud Spring
Red Rock Spring #2
Getchel Spring
Kelseys Spring diversion through Angells Ditches
Muddy River diversion

ARIZONA

Salt Spring
Burro Spring
Lucky 7 Spring
Grapevine Spring
Tassi Spring
unnamed springs (11)

Shivwits Plateau springs (not shown on map):
Twin Springs
Ambush Water Pocket Spring
Lost Spring
Dripping Spring
End Spring
Middle Spring
Cedar Spring
Frog Spring
Cupe Seep

APPENDIX F: ENDANGERED, THREATENED AND SENSITIVE SPECIES

Lake Mead National Recreation Area, 1992

The following species are listed as Nevada endangered species, and are candidates for federal listing. They are known to occur in the park.

Candidates for federal list:

Plants:

Bear paw poppy (*Arctomecon Californica*)
Desert milk-vetch (*Astragalus geyeri* var. *triquetrus*)
Sticky buckwheat (*Erigonum viscidulum*)
Rosey colored beardtongue (*Penstemon bicolor* var. *roseus*)
Canyon wildrose (*Rosa stellata abyssa*)

Mammals:

Townsend's western big-eared bat (*Plecotus townsendii townsendii*)
Arizona myotis (*Myotis lucifugus occultus*)
California leaf-nosed bat (*Macrotis californicus*)
Spotted bat (*Euderma maculatum*)
Mexican Free-tailed Bat (*Tadarida brasiliensis*)
Southwestern river otter (*Lontra canadensis sonorae*)
Desert bighorn (*Ovis canadensis nelsoni*)

Birds:

Western snowy plover (*Charadrius alexandrinus nivosus*)

Reptiles:

Gila monster (*Heloderma suspectum*)

Amphibians:

Relict leopard frog (*Rana onca*)
Lowland leopard frog (*Rana yavapaiensis*)

Snails and Slugs:

Grand Wash spring snail (*Pyrgulopsis bacchus*)

Federal endangered:

Birds:

California brown pelican (*Pelecanue occidentalis californicus*)
Bald eagle (*Haliaeetus leucocephalus*)
Peregrine falcon (*Falco peregrinus anatum*)
Yuma clapper rail (*Rallus longirostris yumanensis*)
Least bell's vireo (*Vireo bellii pusillus*)

Fish:

Bonytail chub (*Gila elegans*)
Humpback chub (*Gila cypha*)
Colorado squawfish (*Ptychocheilus lucius*)
Razorback sucker (*Xyrauchen texanus*)

Federal threatened:

Birds:

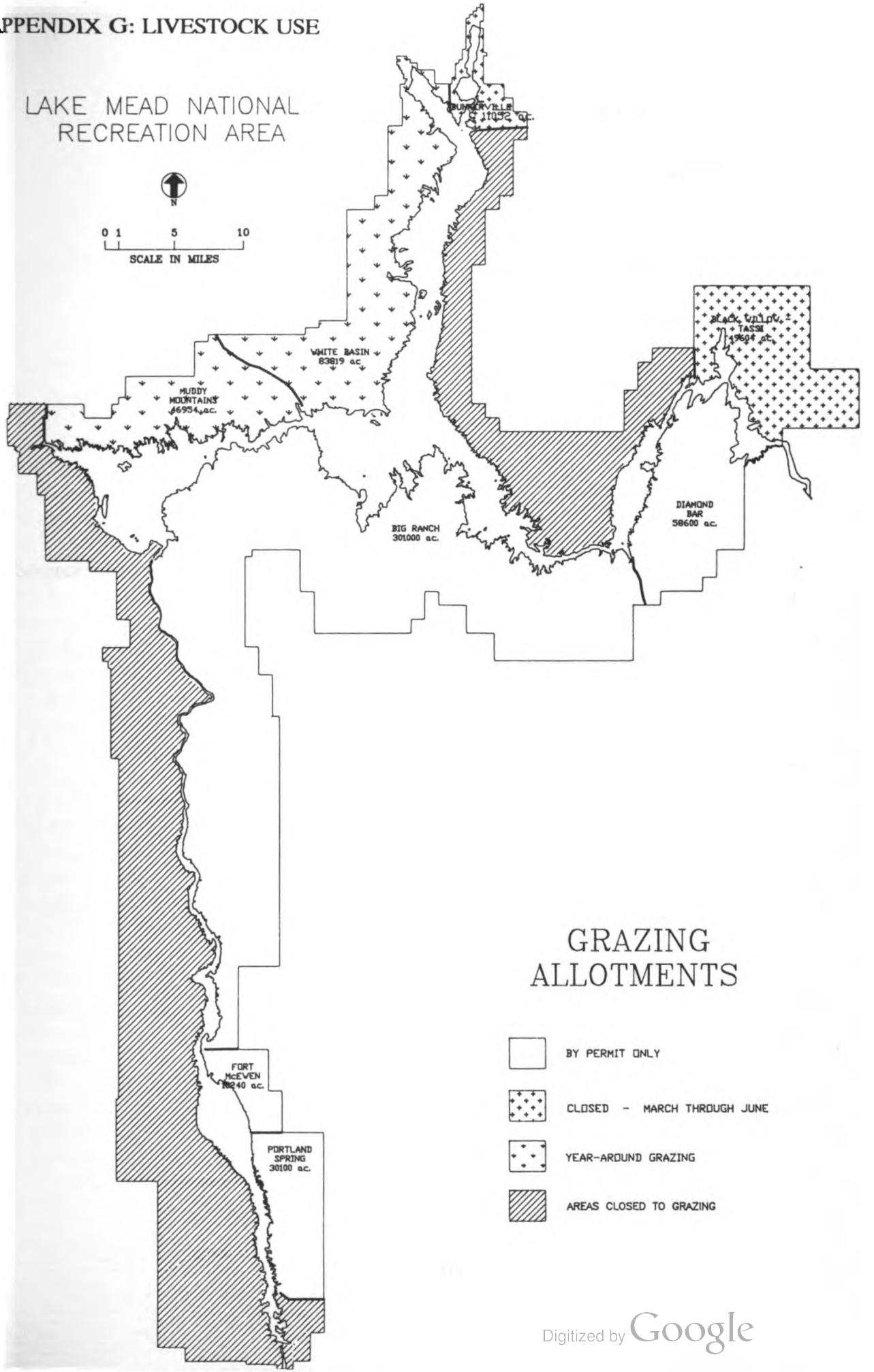
Mexican spotted owl (*Strix occidentalis lucida*)

Reptiles:

Desert tortoise (*Gopherus agassizi*)

There are 56 species of plants in the recreation area protected under the Arizona native plant laws.

APPENDIX G: LIVESTOCK USE



APPENDIX H: BURRO POPULATION DATA

Date	State	Estimated Burro Population
1991	Arizona	3062
1991	California	2209
1991	Idaho	1
1991	Nevada	1599
1991	Oregon	6
1991	Utah	100
1992	Arizona	3536
1992	California	2084
1992	Idaho	1
1992	Nevada	2022
1992	Oregon	6
1992	Utah	104

Source: Bureau of Land Management Herd Area Statistics, 1992.

APPENDIX I: PLANTS UTILIZED BY BURROS

This information was compiled from Death Valley National Monument and Grand Canyon National Park studies, and field observations from Lake Mead NRA.

The following plants occur within Lake Mead NRA and are utilized by burros in the Southwest:

Catclaw (*Acacia greggii*)
Bentgrass (*Agrostis semiverticillata*)
Four o'clock (*Allionia incarnata*)
White bursage (*Ambrosia dumosa*)
Chaff-bush (*Amphipappus fremontii*)
Fiddle-neck (*Amsinckia tessellata*)
Threeawn (*Aristida* sp.)
Four-wing saltbush (*Atriplex canescens*)
Desert holly (*Atriplex hymenelytra*)
Desert saltbush (*Atriplex polycarpa*)
Seep-willow (*Baccharis glutinosa*)
Sweetbush (*Bebbia juncea*)
Gramagrass (*Bouteloua*)
Red brome (*Bromus rubens*)
Senna (*Cassia armata*)
Palo verde (*Cercidium microphyllum*)
(*Chaenactis stevioides*)
Spiny chorizanthe (*Chorizanthe brevicornu*)
Rabbitbrush (*Chrysothamnus* sp.)
Blackbrush (*Coleogyne ramosissima*)
(*Cryptantha* sp.)
Silky dalea (*Dalea mollis*)
Saltgrass (*Distichlis spicata*)
Brittlebush (*Encelia farinosa*)
(*Encelia virginensis*)
Mormon tea (*Ephedra* sp.)
Buckwheat (*Eriogonum fasciculatum polifolium*)
Desert trumpet (*Eriogonum inflatum*)
Fluffgrass (*Erioneuron pulchellum*)
Filaree (*Erodium cicutarium*)
Winterfat (*Eurotia lanata*)
Six-weeks fescue (*Festuca octoflora*)
Hopsage (*Grayia spinosa*)

Snakeweed (*Gutierrezia sarothrae*)
Goldenbush (*Haplopappus cooperi*)
Big galleta (*Hilaria rigida*)
Wall barley (*Hordeum leporinum*)
Foxtail (*Hordeum jubatum*)
Cheesebush (*Hymenoclea salsola*)
Rush (*Juncus* sp.)
White ratany (*Krameria grayi*)
Range ratany (*Krameria parvifolia*)
Peppergrass (*Lepidium* sp.)
Deer-vetch (*Lotus tomentellus*)
Wolfberry (*Lycium andersonii*)
Mohave aster (*Machaeranthera tortifolia*)
Spiny menodora (*Menodora spinescens*)
Wishbone bush (*Mirabilis bigelovii*)
Muhly (*Muhlenbergia* sp.)
Evening primrose (*Oenothera* sp.)
Indian ricegrass (*Oryzopsis hymenoides*)
Penstemon (*Penstemon* sp.)
Phacelia (Phacelia sp.)
Phlox (*Phlox stansburyi*)
Arrow-weed (*Pluchea sericea*)
Mistletoe (*Phoradendron californicum*)
Reedgrass (*Phragmites australis*)
Ground cherry (*Physalis crassifolilia*)
Indian wheat (*Plantago insularis*)
Rabbit-foot grass (*Polypogon monspeliensis*)
Cottonwood (*Populus fremontii*)
Honey mesquite (*Prosopis glandulosa*)
Screwbean mesquite (*Prosopis pubescens*)
Desert almond (*Prunus fasciculata*)
Paperflower (*Psilostrophe cooperi*)
Indigobush (*Psorothamnus fremontii*)
Paperbag plant (*Salazaria mexicana*)
Willow (*Salix exigua*)
Russian-thistle (*Salsola paulsenii*)
Sage (*Salvia* sp.)
(*Schismus* sp.)
Bulrush (*Scirpus* sp.)
Desert mallow (*Sphaeralcea ambigua*)
Alkali sacaton (*Sporobolus airoides*)
Sand dropseed (*Sporobolus cryptandrus*)
Wirelettuce (*Stephanomeria pauciflora*)
Desert stipa (*Stipa speciosa*)
Tamarisk (*Tamarix ramosissima*)
Honeysweet (*Tidestromia oblongifolia*)
Slim tridens (*Tridens muticus*)

APPENDIX J: SECTION 7 CONSULTATION WITH USFWS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
RENO FIELD OFFICE
4600 Kietzke Lane, Building C-125
Reno, Nevada 89502-5093

December 2, 1992
File No. NPS
1-5-93-SP-19

Memorandum

To: Superintendent, Lake Mead National Recreation Area, Boulder City, Nevada

From: Field Supervisor, Reno Field Office, Reno, Nevada

Subject: Burro Management Plan and Environmental Impact Statement

The Fish and Wildlife Service (Service) received your request for information on issues related to a proposed Burro Management Plan (Plan) and Environmental Impact Statement for the Lake Mead National Recreation Area (Area). We recommend the following issues be considered when you develop the Plan.

Threatened and Endangered Species

On November 3, 1992, pursuant to the Endangered Species Act of 1973, as amended, we sent an inventory of listed and proposed endangered and threatened species and candidate species that occur in the Area and could be impacted by the Plan. During development of the Plan, a determination should be made if any of the endangered or threatened species will be affected by the alternatives. We are particularly concerned with the potential impacts of burro populations on desert tortoises (Gopherus agassizii) which occur in the Area. Burro populations should be eliminated or managed in such a way that they have no impact on tortoises.

If you determine that a listed species may be affected by the proposed project, you should initiate consultation pursuant to 50 CFR § 402.14. Informal consultation may be utilized prior to a written request for formal consultation to exchange information and resolve conflicts with respect to a listed species. If a biological assessment is required, and it is not initiated within 90 days of your receipt of this letter, you should informally verify the accuracy of this list with our office. If, through informal consultation or development of a biological assessment, or both, you determine that the proposed action is not likely to adversely affect the listed species, and the Service concurs in writing, then the consultation process is terminated and formal consultation is not required.

Although candidate species receive no protection under the Act, early detection of their presence may avoid conflicts at a later date should they become listed. Should a candidate species be affected by the project, we urge you to seek technical assistance from our office. We can assist in

developing the necessary planning alternatives to avoid conflicts should any of the candidate species become listed before completion of the project.

Wildlife Populations and Habitat

Positive and negative impacts, both direct and indirect, to terrestrial and aquatic wildlife and habitats should be identified for each alternative. Negative impacts that should be addressed include, but are not limited to, destruction or alteration of breeding, nesting, cover and foraging habitat for wildlife. Descriptions of habitat should include both qualitative and general quantitative information. Areas with resources sensitive to burro use, such as unique plant community types, wetland and riparian communities, raptor nesting sites, winter and summer range for deer and wildlife corridors should be identified. We recommend a goal of the plan be to reduce or eliminate impacts by burros to these sensitive resources, especially springs, wetlands, and riparian areas. Furthermore, we recommend that burros be managed to restore or retain the natural diversity of plants and wildlife in the Area. This may require the elimination of burros from particularly vulnerable areas.

We appreciate the opportunity to provide scoping comments on the Plan. If you have any questions or would like to discuss our comments, please contact Paul Barrett or Mary Jo Elpers at (702) 784-5227.

David L. Harlow

David L. Harlow

cc:
Regional Manager, Nevada Department of Wildlife, Las Vegas, Nevada
(Attn: Butch Padilla)
Director, Nevada Department of Wildlife, Reno, Nevada
Assistant Regional Director, Fish and Wildlife Enhancement, Portland, Oregon (AFWE-EHC)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
RENO FIELD OFFICE
4600 Kietzke Lane, Building C-125
Reno, Nevada 89502-5093

November 3, 1992
File No. 1-5-93-SP-19

Memorandum

To: Superintendent, Lake Mead National Recreation Area, Boulder City, Nevada

From: Field Supervisor, Reno Field Office, Reno, Nevada

Subject: Request for Species List, Proposed Burro Management Plan for the Nevada Portion of Lake Mead National Recreation Area (Your Memo, October 14, 1992)

Attached is a list of threatened and endangered species that may be present in the subject project area (Attachment A) as requested. To the best of our knowledge, no proposed species occur within the area. This list fulfills the requirement of the Fish and Wildlife Service (Service) to provide a species list pursuant to section 7(c) of the Endangered Species Act of 1973, as amended (Act). Please reference the species list file number shown on Attachment A in all subsequent correspondence. Attachment B provides a discussion of the responsibilities Federal agencies have under section 7(c) of the Act and the conditions under which a biological assessment must be prepared by the lead Federal agency or its designated non-Federal representative. A list of published references dealing with the distribution, life history, and habitat requirements of the listed species is also attached (Attachment C). This information may be helpful in preparing the biological assessment for this project, if one is required.

If you determine that a listed species may be affected by the proposed project, you should initiate consultation pursuant to 50 CFR § 402.14. Informal consultation may be utilized prior to a written request for formal consultation to exchange information and resolve conflicts with respect to a listed species. If a biological assessment is required, and it is not initiated within 90 days of your receipt of this letter you should informally verify the accuracy of this list with our office. If, through informal consultation or development of a biological assessment, or both, you determine that the proposed action is not likely to adversely affect the listed species, and the Service concurs in writing, then the consultation process is terminated and formal consultation is not required.

Also, for your consideration, we have included a list of candidate species that may be present in the project area (Attachment A). These species are currently being reviewed by the Service and are under consideration for possible listing as endangered or threatened. Candidate species have no protection under the Act, but are included for your consideration as it is possible that one or more of these candidates could be proposed and listed before the subject project is completed. Should the biological assessment reveal that candidate species may be adversely affected, you may wish to contact our office for technical assistance. One of the potential benefits from such technical assistance is that, by exploring alternatives early in the planning process, it may be possible to avoid conflicts that could otherwise develop, should a candidate species become listed before the project is completed.

Please contact Robin Hamlin at (702) 784-5227 if you have any questions regarding the attached list or your responsibilities under the Act.

David L. Harlow

Attachments

ATTACHMENT A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA OF THE PROPOSED

Burro Management Plan for the Nevada Portion of Lake Mead National Recreation Area

File Number: 1-5-93-SP-19

Listed Species

Birds		
E	peregrine falcon	Falco peregrinus anatum
E	bald eagle	Haliaeetus leucocephalus
Reptiles		
T	desert tortoise	Gopherus agassizii
Fishes		
E	Devil's Hole pupfish	Cyprinodon diabolis
E	bonytail chub	Gila elegans
E	razorback sucker	Xyrauchen texanus

(E)--Endangered (T)--Threatened

Candidate Species

Mammals		
2	spotted bat	Euderma maculatum
Birds		
2	western snowy plover	Charadrius alexandrinus nivosus
2	black tern	Chilidonias niger
2	western least bittern	Ixobrychus exilis hesperis
2	loggerhead shrike	Lanius ludovicianus
2	white-faced ibis	Plegadis chihi
Amphibians		
2	relict leopard frog	Rana onca
2	Arizona southwestern toad	Bufo microscaphus microscaphus

Candidate Species continued

Fishes		
2	roundtail chub	Gila robusta
2	flannelmouth sucker	Catostomus latipinnis
Reptiles		
2	chuckwalla	Sauromalus obesus
Plants		
2	desert poppy	Arctomecon californica
2	white bear desert poppy	Arctomecon merriamii
2		Astragalus musimonum
2		Astragalus triquetrus
2	catseye	Cryptantha hoffmannii
2		Eriogonum viscidulum
2		Penstemon bicolor ssp. bicolor
2		Penstemon bicolor ssp. roseus

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(2)--Category 2: Taxa for which existing information indicates may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

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Index